Ethical Behaviour and Moral Decision Making within Virtual Worlds

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Statement of Originality

The work presented in this thesis/dissertation is entirely from the studies of the individual student, except where otherwise stated. Where derivations are presented and the origin of the work is either wholly or in part from other sources, then full reference is given to the original author. This work has not been presented previously for any degree, nor is it at present under consideration by any other degree awarding body.

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Abstract

This thesis explores how immersion in a virtual world (video games and virtual reality) affects moral decision making. In this work, two studies were conducted to explore the effects of each of these virtual worlds.

To explore the effects of immersion in video games, participants were given one of two surveys. One survey focused on their personal moral decision making, and the other focused on their video game characters moral decision making. Little difference was seen between the choices in each survey, saving the majority was the most significant and common choice made, and the immersion of their video game characters proved to have no effect on their moral decision making. This suggests the immersion as their characters has no affect on their moral decision making within hypothetical moral dilemmas.

To explore the effects of immersion in virtual reality, two well-known moral dilemmas known as the "Trolley Problem" and the "Fat Man Problem" were recreated for the study, and contained several variations. A variety of factors that may influence the moral decision making were considered, such as the characters used in the dilemmas, gender differences, involvement and more. A majority of participants made similar choices throughout the "Trolley Problem" with slight variations seen in the "Fat Man Problem". The driving factor for these moral decisions appeared to be the character involved and the individuals attitude towards the simulation.

The main difference found throughout these studies was between the choices made in hypothetical dilemmas (first study) and practical dilemmas (second study), due to the level of immersion, involvement, and attitudes of the participants.

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Chapter 1

Introduction

1.1 Background

Virtual worlds have such an involved nature that they allow users to engage in unique experiences and explore these new environments as if they were actually there. Whether the immersion of these virtual worlds will affect the users behaviour is something that has been considered since the beginning, mainly considered with online video games, and more recently, virtual reality.

1.1.1 Video Games

Video games are set in worlds that can provide a rich story involving the player. The narratives are often so expansive that they have led to the development of other media such as novels, and films. Story elements and choices which involve emotional and moral conflict have become increasingly common in video games, and they are used in an attempt to keep game-play both interesting and diverse for each player. Not every player will have the same idea of how these dilemmas should be resolved [1], [2], which will result in different experiences with each play-through. Game design researchers have investigated why game designers decide on the choices presented to players, and why they seem to differ from game to game [3], [4]. A large influence of player behaviour is the morality system which the game uses. When games design moral systems with consideration of real-world morality, they add new levels of depth to the game. This also allows players to

identify with their character. Specifically, in online games, players who choose to behave as their character rather than their self is known as “role-playing”.

Role-playing is where a player embodies their character and reflects this through their behaviour, speech or actions in the game. Some players even choose to play a character of a different gender, for mostly adventurous or strategic purposes [5], [6]. However, role-playing is often used as a way to fulfil an active imagination, and experience what life could be like as someone entirely different to their self [7], [8]. This then asks, when a player is role-playing as their character and they are presented with a moral decision, do they decide using their personal morality, or do they adopt the perceived morality of their characters? If the latter is the case, this may lead to the player making decisions or behaving in ways different than they would in the real world. This is the focus for the first half of this thesis.

1.1.2 Virtual Reality

Virtual reality (VR) allows for some of the most immersive environments currently available. Recent developments in VR have led to consumer-friendly products which allows developers to create both serious applications [9]–[11] and recreational applications, such as games and chat rooms. VR development has also led to ergonomic controllers such as the Oculus touch controllers, and leap motion which allow users more control of their environment with life-like avatar hands. The immersive environments allow for authentic experiences, which is why VR is used in research exploring moral behaviour and decision making. Research often recreates moral dilemmas in VR to explore how people engage in a realistic dilemma, opposed to the hypothetical variations which will be discussed further in section 2.2.2.2. Whether VR immersion can affect an individuals moral decision making is the focus for the second half of this thesis.

Overall, this thesis explores whether an individual reflects their own moral positions when they are in a virtual world, or whether their moral decision making is affected by the immersion.

1.2 Motivations

Research has continuously investigated morality and ethical positioning. One of the most well known pieces has become a standard for modern moral dilemma research, these are known as the "Trolley Problem" and the "Fat Man Problem" [12]. Each problem can be seen in Figure 1.1. The style of these moral dilemmas have been used as a foundation for many other dilemmas used in research involving moral decision making, which will be discussed later. The Massachusetts Institute of Technology (MIT) have used this style in their machine intelligence research involving self-driving cars and how they should react in a worst case scenario. This research is known as the "Moral Machine" [13].

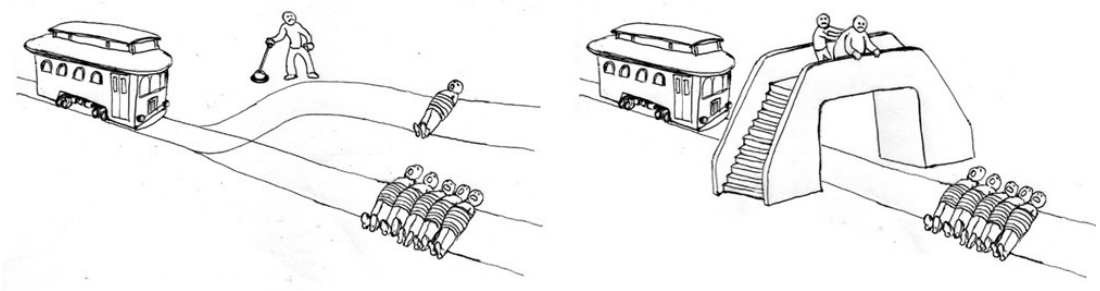


Figure 1.1: "Trolley Problem" (left) and "Fat man Problem" (right) [14].

The "Moral Machine" presents the user with moral dilemmas of a self-driving car with malfunctioning brakes. The user has to decide whether the car should prioritise saving the passengers of the car or the pedestrians the car is heading towards. The characters used in these moral dilemmas consider age, gender, social status and more. When the set amount of dilemmas have been answered, the results will show your preferences in your decisions, as well as how your preferences align with the other users. The moral machine was a strong influence for the first study of this thesis.

The trolley problem has also been applied within other media including TV [15], online videos [16] and video games [17], [18]. Video games utilise these moral dilemmas well as their format is more involved than the other media. Moral dilemmas in video games often provide important story development and game-play options which allows players to personalise game-play. This also allows

for interesting commentary and debate, from both game-play and game design perspectives [19]–[21].

To expand on this, research has investigated how players behave in both online and single player games in regards to ethical and sociological considerations. Existing research for both of these areas will be discussed in the literature review. This thesis explores the effects of a virtual world on a players moral decision making.

1.3 Aim and Objectives

With an understanding of the existing work in these fields, the aim and objectives of the study are defined as follows:

1.3.1 Aim

To explore whether immersion in a virtual world impacts an individuals' moral decision making.

1.3.2 Objectives

1. Conduct a literature review to gain an understanding of research into ethical behaviour, and an understanding of the research involved with player behaviour in video games.
2. To explore whether any significant preference could be found different ages, genders and perceived sentience in moral dilemmas.
3. To interpret behaviour, choices, and the moral foundations when placed in a virtual world with a moral dilemma.
4. To analyse results for noticeable trends or patterns, evaluate the effectiveness of the methodology.
5. Provide conclusions for this research and explore future research possibilities.

1.4 Contributions

Moral behaviour and decision making is a broad field with many possibilities for research, as is the case with behaviour in virtual worlds. The scope of this work lies between these fields, providing insight into how these fields integrate and interact with each other.

This work will contribute to the ongoing research into moral decision making, as well as the research focused on social and ethical behaviour in online video games and virtual reality. These are the three key areas of focus for this thesis and this will provide another insight into each, as well as an overall amalgamation.

Specifically, this research looks at the effects of immersion on moral decision making in video games and in virtual reality. It will explore different theories of morality such as moral foundations and moral competence, and how these may affect an individuals moral decision making when immersed in a virtual world. This work combines these moral measures with their moral behaviour within virtual worlds to investigate areas which have either previously not been explored, or only somewhat explored.

This work has also directly contributed to the teaching of moral philosophy. The virtual reality moral dilemmas used in this work were also used in collaboration with the Philosophy department of the University of Lincoln. Modified versions of the virtual reality project were created for a philosophy study [22], which explored the use of virtual reality to teach moral philosophy to undergraduate students through interactive thought experiments.

Chapter 2

Related Work

This thesis requires an in-depth review of the research relative to this field. The existing work can be separated into two broad sections:

1. Real world ethics and moral decision making.
2. Virtual world ethics and moral decision making.

2.1 Ethics and Moral Decision Making

How we define what is morally right has been debated in philosophy for thousands of years. There are many different theories that have been widely acknowledged for their ethical standpoints throughout history. Some of the first theories date back as far as around 400BC with historical figures such as Aristotle, Plato [23] and Confucius [24] focusing their theories on virtues, and to the 18th century with the work of recognised philosophers Kant [25, p.19] and Bentham [25, p.20] founding their theories on deontological and utilitarian views respectively. Existing ideas have even been adapted in the 20th century, which motivated several post-modern theories, such as Anscombe, Macintyre, and Nietzche with their alternate theories on virtue ethics [25], [26].

2.1.1 Virtue Ethics

Virtue ethics differs from the other approaches of normative ethics as it doesn't focus on the individuals duty or acting to bring good consequences, as deontological and consequentialist theories do respectively. Instead, virtue ethics emphasises the role of moral character and virtues [26]. As previously mentioned, Aristotle is the father of virtue ethics, he was the student of Plato and his work regards the ethical virtues as Plato's did. However Aristotle's work differs as he rejects Plato's ideas that to be a completely virtuous an individual also needs training through sciences and mathematics. Aristotle instead believes that living life well and perfecting ones humanity is the key to being virtuous, which means to be the best one can possibly be through both their thoughts and virtuous actions. He referred to this state of living as "eudaimonia" which translates as "human flourishing" or "prosperity", or more often simply as "happiness" [27], [28].

Throughout time other moral philosophies emerged based on deontological or consequentialist ideals, these ideas focused more on ones' duties or consequences respectively rather than the virtues of an individuals character. This caused controversy among philosophers and led to many criticisms of these theories and their moral focus, this ultimately led to a resurgence of virtue ethics and led into the modern virtue ethic theories we know today. Elizabeth Anscombe in particular was very critical of these theories in her work "Modern Moral Philosophy" [29], she was dissatisfied with the forms of deontology and utilitarianism which focused on law conception and ignored many topics that had been key to virtue ethics, such as moral character, happiness and even the virtues their self [23], [30]. Alasdair Macintyre's book "After Virtue" [31] also criticises the then-modern moral philosophies, claiming that they lack "rational thought" and refuse to admit and explore their failings. Macintyre refers back to Aristotle's moral framework in comparison and argues that the modern frameworks are lacking moral grounding, he also discusses the affects of morality on society.

Modern versions of virtue ethical theories also appeared as different branches of virtue ethics. The idea of eudaimonia has since become its own branch of known

as Eudaimonism. This theory focuses on personal happiness and the idea of a "complete life" as the centre of its ethical concerns [32], Aristotle has argued that *"where a thing has a function the good of the thing is when it performs its function well"* [26] and applies it to individuals and the idea of eudaimonia, which is key to Eudaimonism. Other modern branches or theories of virtue ethics include agent-based theories which are based on common sense intuitions and admirable character traits [33], as well as the ethics of care which argues that morality and virtues should also consider virtues that are exemplified by women such as caring, patience, nurture and self-sacrifice, as these virtues have been marginalised due to contributions by women philosophers being constantly undervalued or ignored [34].

Virtue ethics is a key area in moral philosophy and a large field to consider, this provides a suitable overview and history before moving on to discuss utilitarianism and deontology in the next section.

2.1.2 Utilitarianism and Deontology

Deontology and utilitarianism are two of the more commonly discussed theories in this field of work on moral decisions and reasoning, as such they are the two theories of focus in this work. Deontology argues that morality is based on duties and obligations, so *"an agent has a duty to act in accordance with a moral norm, irrespective of the (potentially beneficial) effects of acting otherwise."* [35] which otherwise could be described as the consequences of an action not justifying the action itself as morally right, or the ends do not justify the means. Utilitarianism is an approach based on consequentialism, which claims that *"Classic utilitarians held hedonistic act consequentialism."* where *"Act consequentialism is the claim that an act is morally right if and only if that act maximises the good, that is, if and only if the total amount of good for all minus the total amount of bad for all is greater than this net amount for any incompatible act available to the agent on that occasion."* [36]. This could otherwise be described as a morally right actions consequences justifies the means, as long as the action maximised the overall net good, where good can be described as pleasure or satisfaction. Some approaches

within utilitarianism consider the theoretical or actual consequences of an action to decide whether the action can be considered morally right.

Each of these theories have been applied and compared within research which uses the previously mentioned "Trolley" and "Fat Man" problems [12], as well as other moral dilemmas. The actions and consequences in these dilemmas align with the main philosophies of these theories. It is also worth mentioning the distinction between "doing harm" and "allowing harm" in context of the "Trolley" problem. The two paths of the trolley could be considered the difference between doing harm (pulling the lever to hit the one) and allowing harm (not pulling the lever to hit the five). This idea is often associated with the "Trolley Problem" although whether it should or not has been debated based on whether the actions of the problem accurately represent "doing" and "allowing" harm [37]. It should also be noted that the terminology used in these problems can affect the decisions made as previous research has found [38]. This was considered for this thesis throughout the design of the studies.

The "Trolley" and "Fat Man" problem have been adapted to the form of questionnaires and hypothetical scenarios to gain an understanding of how individuals attempt to resolve these moral dilemmas. Some research has used a variety of contexts with approval ratings of each of the actions and outcomes [39], where others first ask what they believe should be done by someone who has the ability to intervene, followed by what they personally would do in these dilemmas [40], [41]. Existing research has also found that priming individuals with different "rules" of "saving lives" or "not to kill" can affect decision making processes, as well as the willingness to intervene in a moral dilemma which shows how the different terminology used can affect an individuals moral decision making process [38].

Bartels' [42] work has also investigated moral dilemmas around the "utilitarianism versus deontology" debate. They used, as described, "vividness" (vivid descriptions of harm) and "catastrophe" (larger amounts of people involved) cases alongside the standard cases. The hypotheses were that there would be an overall deontological preference to the "vivid" cases, and an overall utilitarian preference to the

"catastrophe" cases, the results supported these hypotheses. Bartels' work also presented participants with a scenario where either an action or omission would result in death(s), and they were asked whether the individual in the scenario broke a moral rule based on their own protected values (PVs). These PVs are a contextual factor that could affect moral judgements between individuals. Bartels work has also found that PVs of an individual can affect their moral judgements, it can result in prominent deontological principles and insensitivity to the consequences of their choices [43]. Alternatively, work by Bartel and Pizarro [44] has argued against the idea that utilitarianism is the "appropriate" framework to evaluate moral judgement. They found that certain personality traits such as psychopathy and machiavellianism are common among individuals who display a utilitarian thought process, where many would consider these personality traits as immoral.

Across the existing hypothetical work regarding moral dilemmas, it is commonly found that more people favour saving the majority unless there is a significant increase of involvement or the language used in the dilemmas has been altered significantly from the original [38], [39], [45].

While this work dates back many years, it allows for an overview of the field through its development and provides an important background for this thesis. This existing research focuses on how hypothetical moral dilemmas are resolved by an individual and how moral decisions are made. This is done by investigating the context, the descriptiveness and more, as well as which giving insight to which moral theories appear most influential in an individuals moral decision making process.

2.1.3 Assessing Morality

Continuous research into moral decision making has led to a variety of methods to assess the different processes and reasoning behind an individuals morality. Many have attempted to assess moral reasoning based on areas such as competence, foundations, and development from a young age. One established theory on

assessing moral development is from Kohlberg [46], which contains six orientation stages separated into three levels known as the "pre-conventional", "conventional" and "post-conventional". An individual at a pre-conventional level of moral development dictates actions by either physical or hedonistic consequences, such as rewards or exchange of favours, this is typically found in children. An individual at a conventional level considers the expectations of the relative group and conforms to the social order of that group, by both seeking approval of those around them and upholding fixed rules and authority, this is typically found in adolescents and some adults. An individual at a post-conventional level attempts to define their moral principles both within their relative group, as well as their own ideals. They put emphasis on the law and how it could be changed to benefit others. It also focuses on a universal and logical comprehension of what is morally right, considering principles of justice, reciprocity, equality and respect for individuals. Using these levels, an individuals moral reasoning was assessed through an interview which used moral dilemmas, such as the "Heinz's Steals the Drug" problem [47], where the focus would be on the reasoning behind the decisions made rather than a yes or no answer. This was known as the Moral Judgement Interview (MJI) [48]. This work focuses on moral thinking rather than moral action, and describes how even if individuals can talk at a high moral level, this does not mean that they would act at the same level, however Kohlberg believes that slight correlations between thought and action can be considered. Kohlbergs work focuses primarily on moral development through childhood however his work has been influential and laid grounding for future work in this field [49], [50], some even describing it as "landmark research" [25].

While Kohlbergs theory may have been key to the development of this field, this also means that there has been many developments since its conception. This has led to Kohlbergs theory receiving many criticisms, some of the biggest criticisms are about the gender biases of Kohlbergs data and methods [51]. These criticisms discuss the scoring method which was used in the "Heinz" problem, which favoured a reasoning method that was more commonly found in males, meaning that the females would see a lower average of moral development than males. This would be seen through female participants becoming uncomfortable when responding to the dilemma. Further criticisms have been made about the stages and how

a vast majority of responses fall into the conventional stage, with a minority of responses fall in pre or post conventional [52], which demonstrates flaws in Kohlbergs system. Multiple flaws have been pointed out in Kohlbergs system by other critiques which discuss his methodology and how his scoring system can be learnt [53] as well as his questionable and confused moral assumptions and misinterpretations of other research [54], [55].

Another common test for moral reasoning is known as the Defining Issues Test (DIT) designed by Rest [56]. The DIT is similar to the MJI, the difference lies in the method of response-gathering and data analysis, where the MJI uses open-ended verbal communication and its stage score, the DIT uses a likert scale to measure the responses to the moral dilemmas used and calculates a percentage with a "P score". The DIT has been used widely across studies of moral judgement through development and education [57]–[60]. While both the DIT and MJI are widely regarded as valid and reliable means of measuring moral reasoning, work has been done to compare the two methods and each have their known criticisms of potential demand characteristics, requirement for trained interviewers and the limited parametric analysis [61].

This thesis does not focus on Kohlbergs stages of development directly as Kohlbergs work is aimed primarily at moral development through childhood, not to mention the various criticisms of his work, and thus will not be using the MJI. While the DIT would have been suitable due to its ease of use, this thesis decided to use the following measures.

Linds' Moral Competence Test (MCT) [62], formally known as the Moral Judgement Test, was designed to assess moral competence, where it is defined as *"the ability to resolve problems and conflicts on the basis of one's moral principles through deliberation and discussion, instead of through violence, deceit, or bowing down to others."* [63]. The MCT presents participants with two moral dilemmas where a decision is made in each of the stories, they are then are presented with six arguments supporting and six arguments against the decision made in the story. Each of these arguments are based on one of Kohlbergs six stages, although it does not measure for the stages directly. They are then asked to rate on a scale

of -4 to 4 on whether they would reject or accept the statement as an acceptable argument. These answers are then collated and analysed to give a calculated value. This value is called the "C-score" and it determines whether the judgements of the arguments are made from a moral point of view or non-moral factors such as opinion-agreement. The MCT also allows insight into an individuals state within Kohlbergs stages. Since its first publication in 1976 several changes and revisions have been made to improve and modernise the MCT. Its validity has been tested rigorously as it has been used in a variety of work when exploring moral competence, usually with with other factors such as religion [64]–[66].

The MCT was used in the second study of this thesis to assess the moral competency of the participants both before and after their involvement in the study, this will be discussed further in the Methodology section.

Another measure known as the Moral Foundations Questionnaire (MFQ) was designed based on the Moral Foundations Theory (MFT) [67]. The MFT was initially designed to analyse cultures rather than individuals, and there are five virtues in the MFT which are discussed and used to analyse morality. These virtues are used to categorise the foundations that people base their moral decisions on, and which of these foundations are most prominent. These virtues [68] have both evolutionary background and evidence in social psychology, and are categorised for the MFQ under the following titles:

1. *Harm/care: basic concerns for the suffering of others, including virtues of caring and compassion.*
2. *Fairness/reciprocity: concerns about unfair treatment, inequality, and more abstract notions of justice.*
3. *Ingroup/loyalty: concerns related to obligations of group membership, such as loyalty, self-sacrifice and vigilance against betrayal.*
4. *Authority/respect: concerns related to social order and the obligations of hierarchical relationships, such as obedience, respect, and proper role fulfilment.*
5. *Purity/sanctity: concerns about physical and spiritual contagion, including virtues of chastity, wholesomeness and control of desires.*

Haidt, Graham, and Joseph [68] describe these foundations as *"taste receptors of the moral sense, where moral "cuisines" differ around the world."* in reference to the cultural differences that have been found when researching these foundations, and their relation to an individuals morality. While morality is mostly intuitive at a "pre-conventional" level, social factors can influence what we consider important to our moral understanding. The MFQ has been used to validate its cultural theories and support the MFT through research into religion [69], politics [70], [71] and research in non-English speaking countries [72]–[74].

The MFQ offers insight into an individuals moral foundations and their moral decision making processes, which is why the MFQ has been used throughout this thesis to observe if any patterns can be found between an individuals moral decision making process and their preference towards each foundation.

These methods of assessing morality have existed for many years now and some have had constant revisions, the older measures are important to consider due to their development and their influences on the more modern methods of assessing morality. The measures this work has used are modernised means of moral assessment with focus on moral competence and moral foundations, these measures take influence from Kohlberg and Rest to investigate the different areas of moral judgement and reasoning. They also provide a unique combination of measures, and have undergone constant revisions and improvements.

2.2 Ethics in the Virtual World

The development of virtual worlds has led to an interesting discussion around ethical behaviour and morality, specifically in video games and other online mediums. This discussion focuses on similar ideas and areas of work as the research on real world morality. In this section, work will be discussed which explores virtual ethical behaviour and morality, as well as investigating different factors that can affect morality and ethical behaviour in these virtual worlds.

2.2.1 Video Games

Video games are an interactive medium that can use morality to create engaging and interesting game-play experiences, however some game designers have struggled to create meaningful ethical systems in the past [3], [75]. The struggle often results in a "black-and-white" ethical system, which uses numerical scores or scales to determine how morally "good" or "bad" the players character is. This is not the case for morality in the real world. When players are given predefined ideas of morally right and wrong in video games, it hinders any moral thinking the player could engage in as these systems often promote different incentives or consequences for their choices. This takes away focus from the moral struggles that designers may have intended for the players in certain areas of the game [4], [76], [77]. The "Fable" game series uses an example of a "black-and-white" morality system, where players who commit the actions which are predefined as "good" will eventually gain a halo above their character and those who commit action which are predefined as "bad" will gain devil horns and red eyes, the characters around you will also react to your alignment. This system is one of many which has been criticised for its portrayal of a "black-and-white" morality and its superficial approach towards ethical thinking and moral judgement, and how it is lacking depth [78]–[81]. These ethical systems in video games have been a topic of discussion in research, as well as the philosophy of the video games themselves, specifically around game-play experience and game content [82]–[86].

2.2.1.1 Moral Behaviour and Decisions

Research has also combined areas of real world morality with behaviour in video games to explore the moral behaviour of players. A prominent example of this is the previously mentioned Moral Foundations Theory (MFT), this has been used to analyse moral behaviour in video games by exploring how players make moral decisions. It has also been used to explore if players reflect their real world morality when playing video games, or whether their morality alters for any particular reason.

Several pieces of work in this area have specified the MFT as a foundation for their research, where they use the MFQ to determine a participants moral foundations, and then allowed them to play through a game that will present them with moral dilemmas enveloped through game-play and the games story. Any moral decisions would be recorded and analysed with the results from the MFQ to explore which moral foundations were most and least prominent. Weaver and Lewis' [1] work found that a majority of participants treated in-game interactions and moral decisions as they were real world situations. The MFQ results also correlated with any differences in the decisions made between participants, where the *"moral foundations of care and fairness significantly predicted the level of care exhibited by the player... and that the moral foundation of the authority significantly predicted the deference to authority exhibited by the player in the game"*. Alternatively, Joeckel et al. [87] found that moral decisions made in video games are commonly made as a gut decision, or in order to progress through the game. This suggests that not all moral dilemmas implemented in video games result in entirely rational and morally-deliberated choices. This is the area which this work explores further, by using existing measures of morality to observe whether real world morality carries over into the virtual world and what factors could affect this. Further research based on the MFT has found committing immoral actions in games to elicit feelings of guilt and resulting in higher moral salience [88], some research even finding what could be considered extreme cases of guilt known as the "Macbeth effect" [89]. This is where players of a game are found to physically clean themselves more after committing immoral actions, as a sign that they are experiencing moral distress, this work also found that more moral distress was experienced when there was a higher level of realism in the scenarios, or if the players were inexperienced in playing video games. Research has also used other behavioural, psychological and morality measures to explore the relationship between morality and engagement in video games, focusing on moral behaviour and aggression [90]–[92]. The common findings of this research notes that a relationship exists, while there are different factors that can affect a players behaviour such as empathy, length of time playing and if the game contains moral narratives, among others. This suggests that the factors and emotions (moral distress, guilt, empathy) experienced in these virtual worlds could further play a role in the players moral judgement, as it would in the real

world. If experiences in virtual worlds can affect them emotionally, despite having no real consequence in a video game, this suggests that it could affect their moral reasoning and judgements as well. This further suggests that a players morality in video games could replicate a realistic process for resolving moral dilemmas.

An alternative reason as to why players sometimes behave as they do is known as "Moral Disengagement". This is a term referred to by Hartmann and Vorderers [93]. They explored this as an idea for why players would experience less guilt, negative affect and game enjoyment. This is where an individual becomes morally detached and believes that their known ethical standards don't apply to them, as they're playing a video game, and their actions have no consequence in the real world. By altering the context and consequences of their actions within a violent video game, Hartmann and Vorderer found this to be true with regards to guilt and negative affect, however level of enjoyment found mixed results. They also found that participants awareness of it being "just a game" reduced guilt and negative affect. The idea of using "just a game" as reasoning for a players moral behaviour in video games has been explored by Croft [94] where he interviewed participants using an ethical dilemma, inspired by Kohlbergs Moral Judgement Interview (MJI). The moral dilemma focused on the player selling "Pseudogems" for an extortionate price to new players of an online video game, despite "Pseudogems" being worthless. Results found that around 13 participants would sell these gems. Their reasoning mainly focused on the idea that "it's just a game, it's not real", as well as there being no consequences for doing so, the idea of competition, and some blaming the players for not knowing the game well enough. Some participants also justified their actions by stating that selling gems is helping teach new players how not to get scammed. Some participants also reinforced that they would never do this in real life, which demonstrates the idea of "moral disengagement". 8 participants would not sell the gems, with their reasoning mainly driven by an idea of fairness, with the idea that you should "do unto others as you would have them do unto you", and the overall effect it might have on the games community. These considerations seem grounded in the fairness foundation from the MFT, which demonstrates theories of morality playing a role in virtual ethical behaviour. There were also 6 responses that displayed mixed feelings, where participants discussed different ideas such as the economy of the

game, how common currency is to find in the game or how long they intended to play the game for. They go on to discuss that if the games circumstances were not going to cause the suffering of a player or the community, then they could be persuaded to sell the gems, despite the acknowledged immorality of selling the gems. Another concern mentioned the survival of the player, some would sell the gems if it meant life or death for their character. Further, some said they would sell the gems if the buyer had a bad attitude, and they would not oppose punishing them. Again, this shows relation to the real world, basing their reasoning on fairness and only if absolutely necessary. This gives an insight to moral reasoning inside a virtual world, with examples of those who do and do not use their personal morality as a basis for how they make their decisions, as well as those who become conflicted with the situation and only made decisions based on different context.

Further research has explored the possibility of a relationship between moral disengagement and real world immoral behaviour, mainly focusing on violent video games [95]–[98] with findings showing that moral disengagement and dehumanisation is a common occurrence when playing violent video games. This is seen as an attempt to minimise any moral concerns within game play where moral reasoning is intended.

The idea of moral disengagement in video games is a one of several reasons why players may not reflect their personal morality in a virtual world, as well as players who justify their actions with the idea that it is "just a game". How these players make these decisions is one of the main focuses and has been considered throughout this thesis.

2.2.1.2 Social Interactions and Avatar Appearance

Work has also explored the social behaviour that players exhibit within online video games. This social behaviour includes interactions between players and group dynamics.

Previous work has found that through online video games, friendships have been created where players are willing to discuss sensitive issues and socialise in real life together. Emotional and physical relationships have also been formed through online games with most finding that gaming together had a positive effect on their relationships [99], furthermore both pro-social and anti-social behaviours are determined by the players attachment to their character, with differences found between young and old gamers. Anti-social gamers are likely to disregard the game environment and their virtual actions, as well as potentially morally disengage when playing the game. Pro-social gamers tend to take more responsibility for how they behave [100], in specific cases players adopt a supportive role in the community by setting up guilds, clans and player groups that specialise in helping other players, either by helping them learn how to play the game, or offering delivery and transportation services [101]–[104]. In certain cases, players find that their experiences while online are more meaningful than those in real life, both positively and negatively. Yee [105] states that *"In fact, there now exist massively multi-user online environments (such as There.com or Second Life) where the dominant activities are poetry readings, fashion shows, pop concerts, and even romantic encounters along star-lit beaches. In other words, the very same things that people do in real life."*. Even social norms have been found to cross over into the virtual world [106] through analysing eye gaze, interpersonal distance and gender-based social norms in the virtual world, and then comparing them to behaviours in the real world. Another quote from Yee states *"If people behave according to the same social rules in both physical and virtual worlds even though the mode of movement and navigation is entirely different (i.e., using keyboard and mouse as opposed to bodies and legs), then this means it is possible to study social interaction in virtual environment and generalise them to social interaction in the real world."*.

Another research area focuses on how different avatar appearances can impact player behaviour. Research has investigated whether this can have an effect on a players behaviour. Work has found that the perceived aggression and trustworthiness of NPCs can impact a players moral decision making [107], as well as perceived genders of the NPCs affecting how players treat them. Headleands work found that when tasked with protecting one of three different

NPC companions (Robot, Male, and Female). The robot NPC companion was the most neglected by players, whilst the female NPC was the most protected by players [108]. If the perceived appearances, characters and genders of avatars can affect players social behaviours in the virtual world as it can in the real world, then there's a possibility that the morality they adopt in these worlds reflects their personal morality. To expand on this idea is the "Proteus Effect", which is an interesting concept introduced by Yee and Bailenson [109]. The proteus effect describes how the behaviour of a player in a virtual world can be altered by the characteristics of their avatar. Yee and Bailenson found that the attractiveness of a players avatar affected their intimacy with a stranger, and their perceived height affected their confidence levels. The proteus effect suggests that an avatars appearance can lead to the de-individuation of the player, which could result in a situation where individuals become morally disengaged and adopt a morality that is not their own, such as their characters perceived morality. Alternatively, Messinger et al. [110] found that players create their online avatars to appear as themselves with slightly enhanced features to make them feel more attractive, in turn this allows players to behave similar to how they would in the real world but with less restraint and more extroverted behaviours. This is another example of how players exhibit real world behaviour in virtual worlds, while still experiencing the Proteus effect.

It's important to note that while some of the research into virtual interactions and avatar appearance is fairly dated, its contributions to the development of this field are so significant that it must be considered through the framing of this thesis and its studies.

If social behaviours and the effect of appearance in virtual worlds mimic the real world as research suggests, then it's reasonable to suggest that individuals carry over their personal morality when entering virtual worlds, as they do with their social interactions, social norms and other behaviours. However, depending on the players susceptibility to the Proteus effect or moral disengagement, they may adapt a moral position that does not reflect their own personal morality.

2.2.2 Online Avatar Behaviours

There are various mediums that allow users to create online avatars, such as Massively Multiplayer Online Role-Playing Games (MMORPGs) and virtual reality. It has been found that these online avatars can affect a users behaviour and how they interact with each other online.

2.2.2.1 Character Creation in MMORPGs

In most MMORPG games one of the first things you are asked to do is create your own avatar or character. This includes a variety of aspects from customising their looks, or their species, to giving them a unique name, to designing parts of their origin story. This allows for players to personalise their characters to their design and as previously mentioned in chapter 2.2.1.2, some players design characters to resemble their self, perhaps slightly enhanced versions of their self so they can still identify with their character [111] but also be the "ideal version of their self" [112]. Whereas other players design characters which are completely dissimilar from their self, which can allow them to engage in the fantasy of this different person or creature and behave in line with how they would perceive them to act [109]. Previous work has suggested that building a character based on your ideal self is more common in those with a lower psychological well-being be that depression or lower self-esteem [113].

Character creation has also been explored in regards to how the customisation affects the players in game. Previous work has investigated if there is any correlations between character customisation and a player's personality, and found that there have been differences in preference of species between men and women, as well as preference of "good" or "evil" [114] and the differences in roles they played [115]. Other work has found that characters which resemble their players can lead to a more emotional connection between the player and their avatar [111], and again this has been found to be stronger in those with low self-esteem and those who play for long hours [116].

Another fascinating aspect of character creation is commonly known as "Gender Swapping". This is where a player creates a character of the opposite sex, usually for some sort of benefit or a different experience. Previous work has found that it is a trait more commonly found in men more than women [117]–[119], while others have found that the opposite [5], [120], this could be due to the character creation available or other demographic factors.

Players usually gender swap for a different experience in game with others, a few extracts from Hussain's [5] work state *"Because if you make your character a woman, men tend to treat you FAR better."*, and *"I mostly play female characters but sometimes I make a male character and don't let anyone know I'm female in real life. It's interesting how different people treat you when they think you are a male. Kind of like a window into their strange man universe."*, these demonstrate how different genders are treated in game, some even providing actual in-game advantages as stated *"If you play a chick and know what the usual nerd wants to read, you will get free items, which in turn I pass them to my other male characters, very simple. Nerd plus Boob equals Loot."*, which could be a major reason male players create female characters. Others have claimed that they choose to gender swap just to *"experience something I am not and if I am going to be a half rotten walking corpse... what's so strange about wanting to switch gender?"* [121], these different experiences allow players to understand the behaviours that the opposite gender are used to encountering, for example the harassment that some female characters and players can get online [119]. It is also common for players to have both male and female characters, to provide a unique play-through for each characters [122].

Much thought goes into character creation and the main factors to consider are the type of game-play players wish to experience. That could be a personalised play-through with a character resembling their self allowing for that emotional connection, or a fantasy escape where players create a character so dissimilar from their self they are free to behave as their character would, or even swapping genders between characters to explore what sort of differences they can find whilst playing as another gender. The reason this is important to this thesis is due to the immersion as their character, if and how their behaviour can change because

of that immersion, and if those changes in behaviour can affect the players moral behaviour.

2.2.2.2 Virtual Reality

Virtual reality (VR) is another medium which uses avatars to represent the user within social apps, games and profiles. When this is combined with an interest in ethical behaviour and morality, it allows research to explore new grounds due to the immersive environments and controls available. VR is still a developing field with the immersion of the technology improving each year in terms of both realistic graphics and ergonomic controls. There are many virtual reality scenarios and simulations which are designed for practical and professional use such as medical training [9], [123] and military applications [124], [125]. Recreational uses such as video games and online worlds have also become popular uses, and there are other uses being explored [126]. The level of immersion that VR provides also allows research to explore existing areas, such as morality and ethical behaviour, with new approaches.

From the earliest stages of VR development, concerns of morality have been considered, especially when the VR experience involves murder, theft and torture of virtual characters. As prior research in the real world does, both deontological and utilitarian ethics are considered [127]. These questions are still in debate especially with the improvement of player immersion. Several moral dilemmas (including the prior mentioned "Trolley" problem) have been recreated in VR for research on moral decision making. They have used measures of emotional arousal [128], autonomic arousal, and reaction time [129], as well as comparison to hypothetical moral dilemmas. The findings of these studies indicate that a majority of decisions made in VR were utilitarian, where greater arousal is associated with involvement in the dilemmas, and even higher when participants were to engage in non-utilitarian actions. The levels of arousal appear to correlate with the decisions made and the medium used. As well as comparing with hypothetical moral dilemmas, research has compared moral dilemmas with desktop scenarios as well [130]. Behavioural responses were recorded from both versions, they found

that immersive VR users experienced more panic, more mistakes and were more likely to give the utilitarian responses in the questionnaire. They also found that despite using abstract avatars in the dilemmas, both the VR and desktop versions provoked strong emotional responses from participants. Although these strong emotional responses from participants warrant caution from using moral dilemmas in virtual reality, they should be created carefully and with full discretion in mind. Further research [131] has investigated the "Trolley Problem" in VR using eye tracking technology and different demographic factors such as gender, ethnicity and body orientation. This research replicated behavioural patterns that were found through hypothetical dilemmas, as well as prevalent social desirability factors such as gender preferences and utilitarian outcomes.

This suggests that analysing moral judgement in VR can produce results as they have been found in previous research exploring moral decision making, although VR diminishes the ethical concerns that exist if research tried to recreate these moral dilemmas in reality. This is where this thesis fits, by using existing morality measures within VR moral dilemmas to observe any behavioural patterns in an individuals moral decision making processes, for the second study.

2.3 Insights

Ethics is one of the most highly debated and fascinating aspects of humanity due to the many theories and arguments made within the field. Due to the amount of different theories and ideas, this has led to the research involving ethics and morality being continuously scrutinised by others [132]–[138]. One of the most popular topics of research is the utilitarian versus deontological debate, focusing on moral decision making, with different measures, factors and reasoning used to determine what causes and affects these decisions.

Existing work has found commonalities with moral dilemmas and the moral decisions made. With hypothetical moral dilemmas, the option which maximises the good of the outcome is often the popular choice among individuals [39]. ,

as the moral value of saving as many lives as possible outweighs the immoral value of whatever action is needed to reach the outcome. However, when certain contexts or graphic vividness of these moral dilemmas is described, the amount of choices which prioritise the majority lowers, and the immoral value of the actions required is raised, which results in a rise of choices which don't prioritise the majority. Using this, it is hypothesised that individuals are likely to opt to save the majority as hypothetical moral dilemmas could be seen as a game of numbers. An individual may hypothetically choose the option which saves the most lives, but if that same person were to actually enter a world and experience that moral dilemma then they may find they act differently to what the previously said, due to the level of personal involvement in the dilemma. Of course, research cannot re-create these moral dilemmas for participants without gross ethical violations and potential traumatising effects, or demand characteristics affecting the results after participants learn the nature of the studies. This is why recent work on real world ethics and moral decision making can only focus on hypothetical moral dilemmas. They can continue changing context, wording and investigating correlations to observe the extent of morality and ethical understanding, however virtual reality allows for the recreation of moral dilemmas, as well as a slightly more realistic observation of moral behaviour due to the immersive environments that virtual reality can create.

Video games also allow researchers to recreate these moral dilemmas beyond text, to create an interactive environment where the individual would need to take action in the moral dilemma, rather than just commenting on what they would hypothetically do. Existing video games also contain moral dilemmas that are used as important story elements. Through custom and existing video games, research has used these as a way to measure moral judgement, and to investigate if there is any difference between morality in the real world and the virtual world. Across this research, common findings appear to show one of two things:

1. The individual invests their real self in the game. They treat any moral decisions as if it were in the real world by feeling emotions such as guilt and moral distress [1], [88]–[92], and is also more likely to engage in pro-social

behaviours [100]–[104]. There are also times where they elicit enhanced behaviours of their real self due to their avatar [110].

2. The individual realises the game is separate from real life, they become morally disengaged as they realise their decisions do not have the consequences as they would in real life, with extreme cases even resulting in anti-social behaviours in game due to a lack of concern for the virtual world around them [93]–[98]. Some players are also known to experience from the "Proteus Effect", where they adopt a personality from their online avatars appearance and characteristics which could be entirely different from their own personality [109]. This may not reflect their real world behaviour but the change in behaviour is notable due to the anonymity of the online world, and is a popular research topic within morality in video games.

These findings prove to be a common occurrence for the research mentioned above, where they are trying to assess morality and player behaviour in video games.

As mentioned, virtual reality (VR) attempts to bridge the gap between reality and the virtual world with an increased level of immersion in virtual experiences, rather than simply on a screen in front of you. Research in VR focuses on creating realistic scenarios which are based on hypothetical moral dilemmas and the common findings show that the immersion of VR plays a key role in the moral decision making process. When emotional arousal and behavioural responses are measured, the responses of participants indicate that they are so immersed that they are unaware it is a simulation, as some even experience panic and guilt [128], [129], [131]. Further, when compared with hypothetical dilemmas, participants may choose to save the majority but find their actions indicate otherwise as they struggle to make that moral decision when in VR [130], as earlier hypothesised. These findings show that VR is an ideal medium which we can currently use to recreate moral dilemmas for research, without directly violating ethical procedures or causing distress. It can also produce life-like results which help gain an understanding of an individuals morality both in and out of the virtual world.

This thesis aims to investigate the ethical behaviour and moral decision making exhibited in virtual worlds. Specifically, this study aims to find if individuals reflect their personal moral views in a virtual world, or whether their moral standpoint is altered due to the immersion. Two studies have been conducted for this thesis, the first study focuses on moral decision making concerning their video game characters, while the second study focuses on moral decision making in VR. The methods, results and analyses are discussed in the upcoming sections.

Chapter 3

Moral Dilemma Web Survey

The first study of this thesis was a web survey designed in a similar style to the previously mentioned Moral Machine [13].

Participants begin by opening the web page, they are then randomly shown one of two possible surveys. The "Personal Survey" that focuses on the participants' personal moral behaviours or the "Character Survey" that focuses on the participants' online video game characters and their moral behaviours. Both of these surveys contain a demographics page for the participants to complete.

If the participant is completing the personal survey, it will then randomise which section they are shown first to avoid any order bias. There are two sections in total, both of which contain a Moral Foundation Questionnaire (MFQ) and a selection of moral dilemmas. One section focuses the MFQ and the moral dilemmas in the real world, whereas the second section focuses the MFQ and moral dilemmas in a video game setting. In the real world section the moral dilemmas contain "Friends" and "Strangers" for the participant to consider, whereas in the video game section the moral dilemmas contain "Friends" and "NPCs" to consider. The personal survey focuses entirely on the participants moral behaviour in both real world and video game settings.

If the participant is completing the character survey they will first be asked to enter details about one of their online video game characters. They will be asked the characters name, what game they are from and a short description of their characters personality. This character will be used throughout the survey as the decider of the moral dilemmas. The participants will then be given an

MFQ to complete focusing on their characters' morality in their video game. Once complete, they are then shown moral dilemmas which are based on a video game environment and contain "Friends" and "NPCs" to consider. Once these moral dilemmas have been answered, participants will then be given an MFQ which focuses on the participants' personal morality, rather than the video game character. This is to see if the participants and their characters moral foundations differ in any way.

Throughout the design it was decided that it is not feasible to ask how a video game character would respond to a moral dilemma in a real world setting which is why the formatting of the surveys differ in the way that they do. The survey still serves its purpose to explore if immersion as a video game character would alter your moral behaviour.

The data recorded from the surveys includes the participants demographic, their MFQ results and their choices in each dilemma. This data is then analysed to determine the most common ages and genders, as well as the averages of the MFQ foundations and any potential trends of preference shown towards characters in the moral dilemmas.

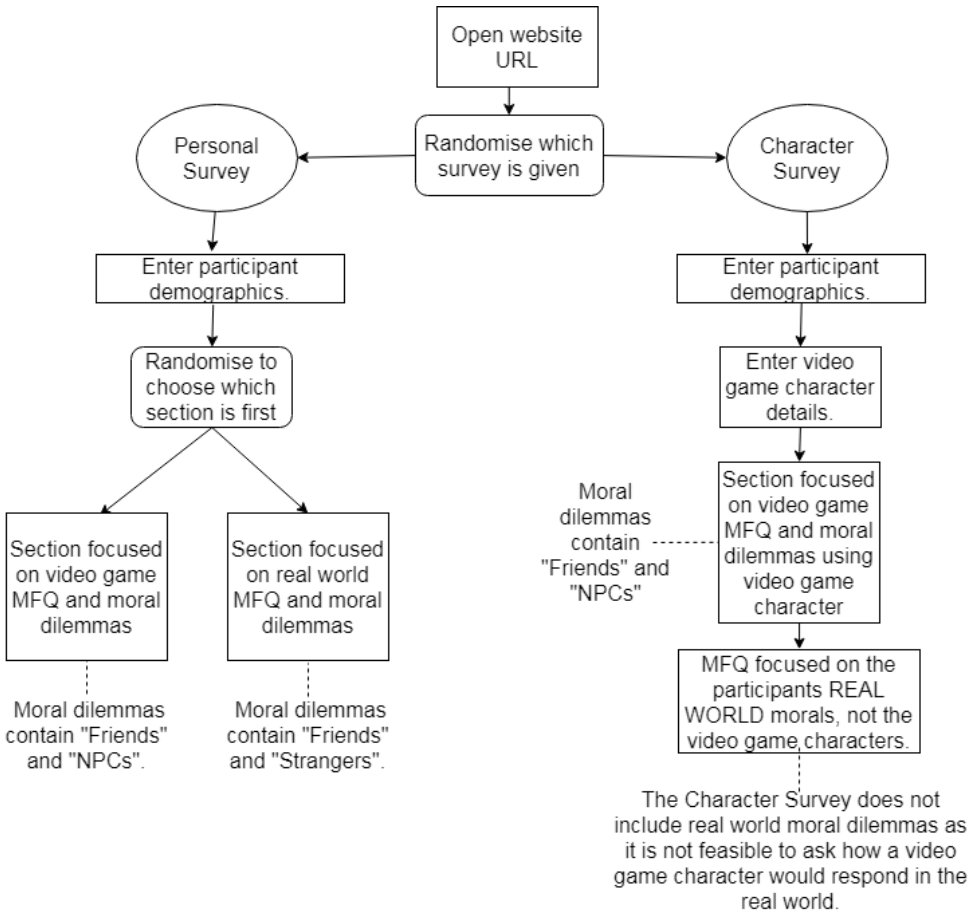
The survey paths as described above can be seen in Figure 3.1.

3.1 Design

The moral dilemmas for the survey were designed based on existing research and other articles focused on moral decision making [139]–[141]. All possible dilemmas were gathered to determine which would be most suitable for the web survey. Examples of common video game moral dilemmas were also explored [142]–[144] to design suitable dilemmas for the surveys.

Possible ideas were then sketched on paper in a format similar to the moral machine layout to visualise what the web survey would look like, one example of the "Trolley Problem" can be seen in Figure 3.2. The dilemmas which were

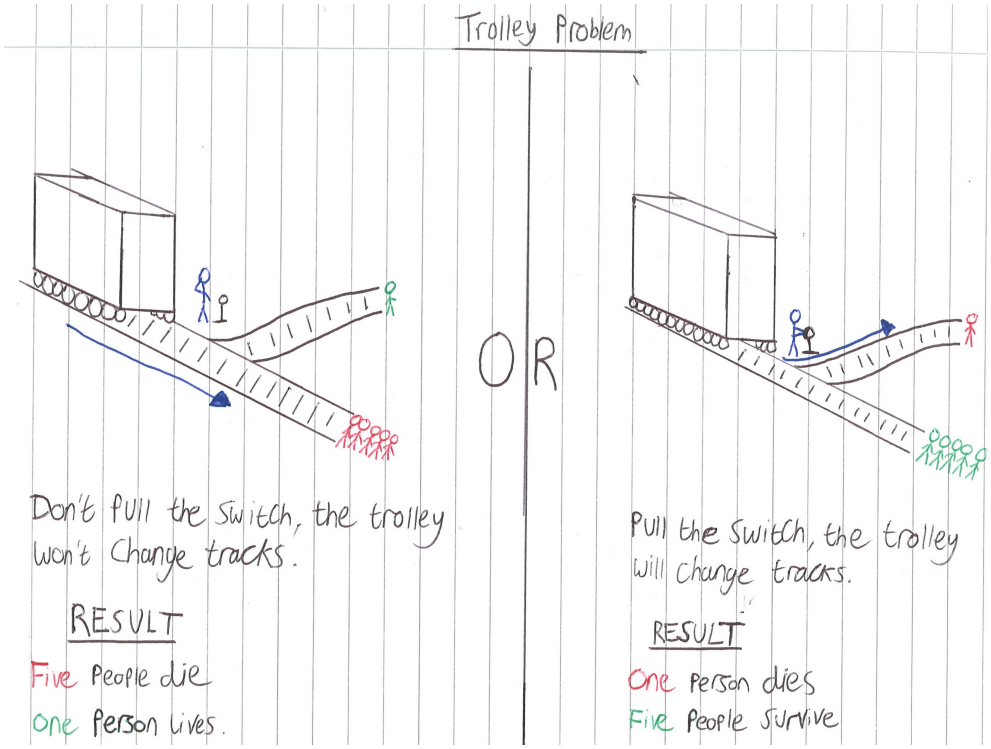
Figure 3.1: Survey paths to show the formatting of the study



chosen were included as they provided a suitable moral conflict for the survey in a variety of different contexts. Some were designed based on existing moral dilemmas which appear commonly in video games using sacrifice and personal gain as common themes, some were designed based on moral dilemmas which have been repeatedly used in philosophical research and some were designed based on moral dilemmas which were found through online research and discussions, often involving media such as film and television. These dilemmas all provided an appropriate moral conflict with various contexts for both the personal and character surveys and were used throughout the survey.

Once the designs for the moral dilemmas were finalised, the next step was to decide how to adapt the MFQ to be used in an online web survey. The MFQ can be seen in Appendix C, this is a printed version which would not be suitable for use online. The MFQ would only be altered by removing a self-scoring grid to avoid demand characteristics. The format would be updated for the survey.

Figure 3.2: A sketch of the trolley problem in the moral machine format.

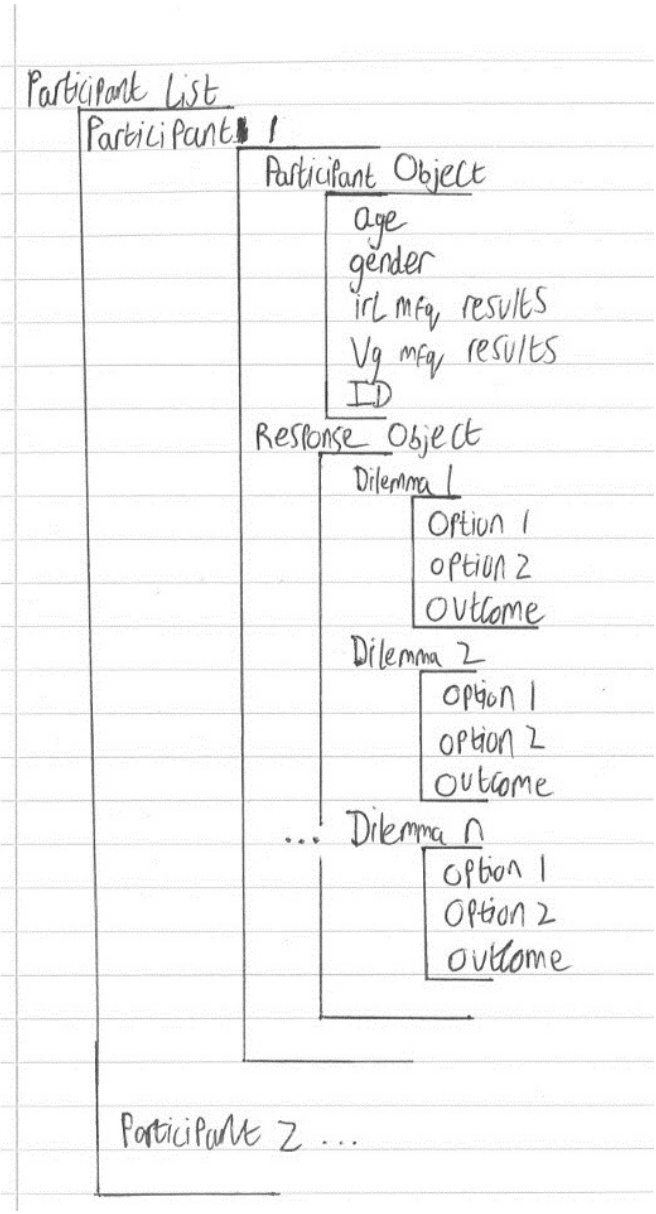


The best format was decidedly a likert scale as these are commonly used for questionnaires, and would be familiar for participants.

As a large amount of data would be collected from each participant, the storage of that data also required designing to keep it coherent and easily accessible when analysing the results. The data formatting was sketched out as can be seen in Figure 3.3.

It was also important to consider the ethical implications of this study and what issues needed to be avoided. They were informed of the purpose of the study at the start and told that their responses would be collected for the purpose of the study, and they were given unique identifiers for anonymity. They also had the right to withdraw at any point through the study, as well as after the study by quoting their unique identifiers. Also as this study involved the use of moral dilemmas with potentially upsetting situations, the potential trauma and upset of the participants was considered. The design of the dilemmas reflects this as only the vital information and imagery was used in these dilemmas to avoid any graphic or upsetting content.

Figure 3.3: A sketch of the format for how the survey responses would be stored.



3.2 Method

The web survey was built using HTML, Javascript, jQuery and CSS, the data was collected in a Google Firebase which collected the results and demographics of the participant. The dilemma diagrams were created in GIMP 2 [1] using a combination of vector images from Vecteezy[145] and custom graphics.

The survey navigation and outcome selection was created using jQuery to load new HTML elements with new dilemmas and different forms, as well as edit the CSS of the outcomes based on selection. The CSS was used to format the layout of the survey and demographic forms to match the sketches.

Once the layout and basic functionality was implemented, the next step was to load the characters onto each dilemma. Each dilemma used in the survey can be found in Appendix A. This included the character images, the outcome text, and the death image for the corresponding outcome. For example, in Figure 3.4 you can see that the dilemma has loaded with the characters placed on either side of each image. It also shows the outcome of each option, which is denoted by the skull image over the character, and the text in the outcome sections.

With the characters loading in to the dilemmas, they needed to be positioned correctly for each custom image used for the moral dilemmas as shown in Figure 3.5. An array of characters with different genders, ages, and relationships was used for each scenario. The characters were loaded randomly to create dilemmas with a variety of choice, this is to determine if any patterns of preference existed when making moral choices with these different characters.

The next step was to amend the character arrays for each dilemma by including characters which were either assigned as a “Friend”, a “Stranger”, or an “NPC” (Non-player controlled character) depending on the current dilemma. The video game focused survey would only use video game scenarios for their characters, so only “Friend” and “NPC” characters would be used, whereas in the personal

[1] The GIMP Team, GIMP - GNU Image Manipulation Program, 1997-2018

Figure 3.4: Beginning of character implementation and outcomes of scenarios.

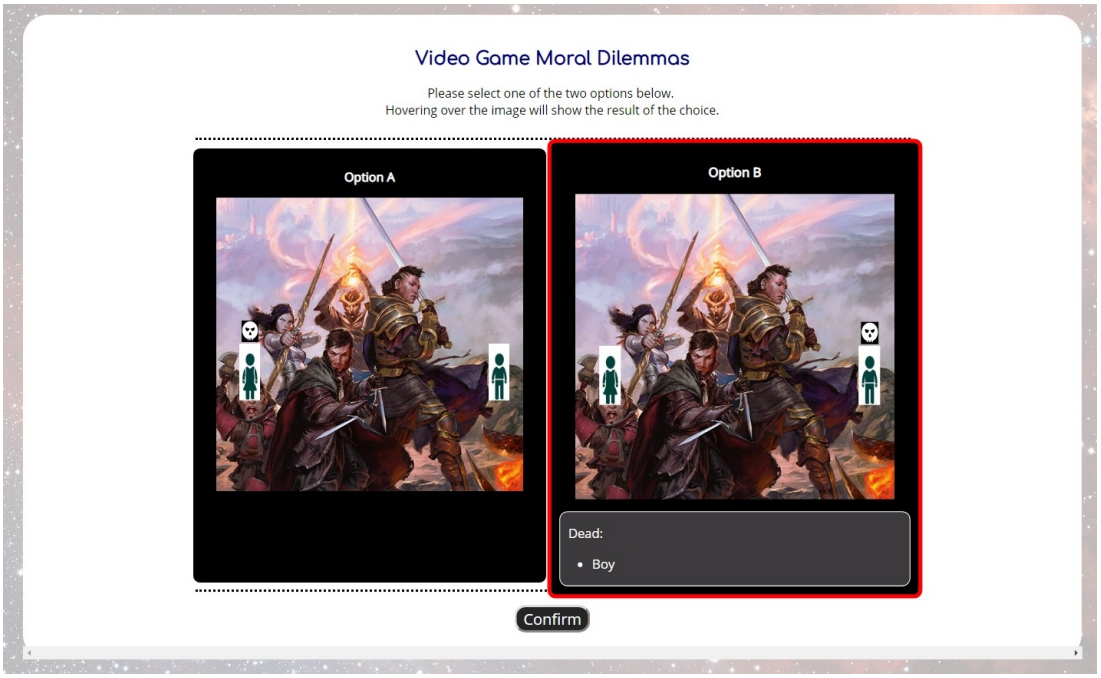
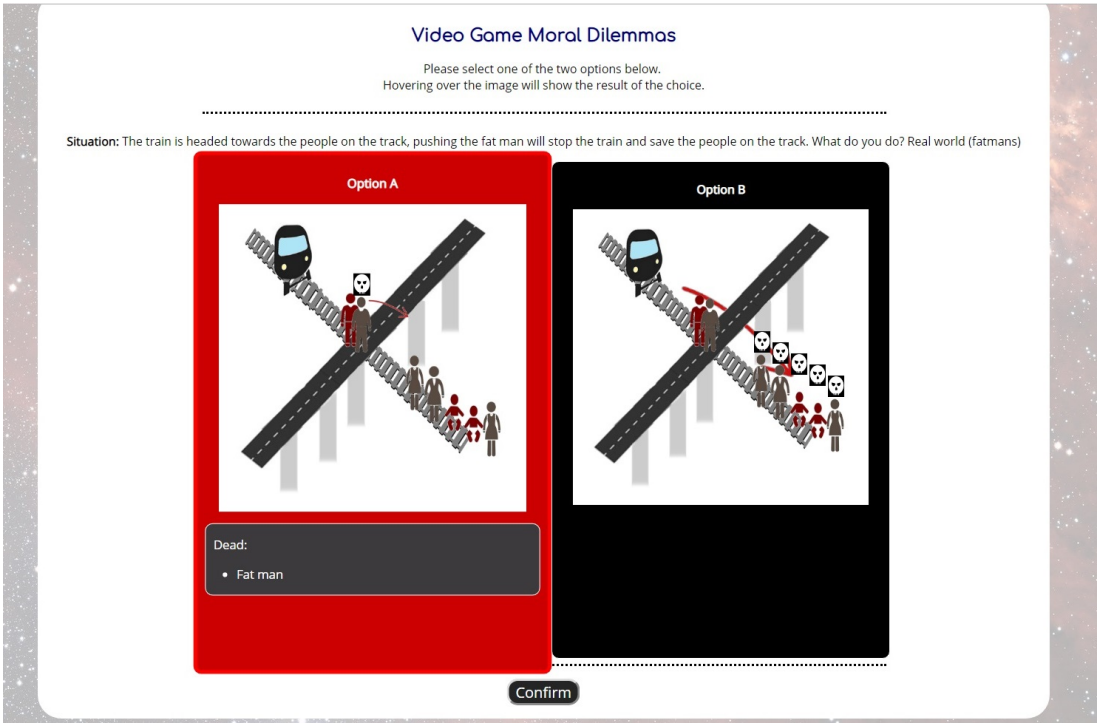


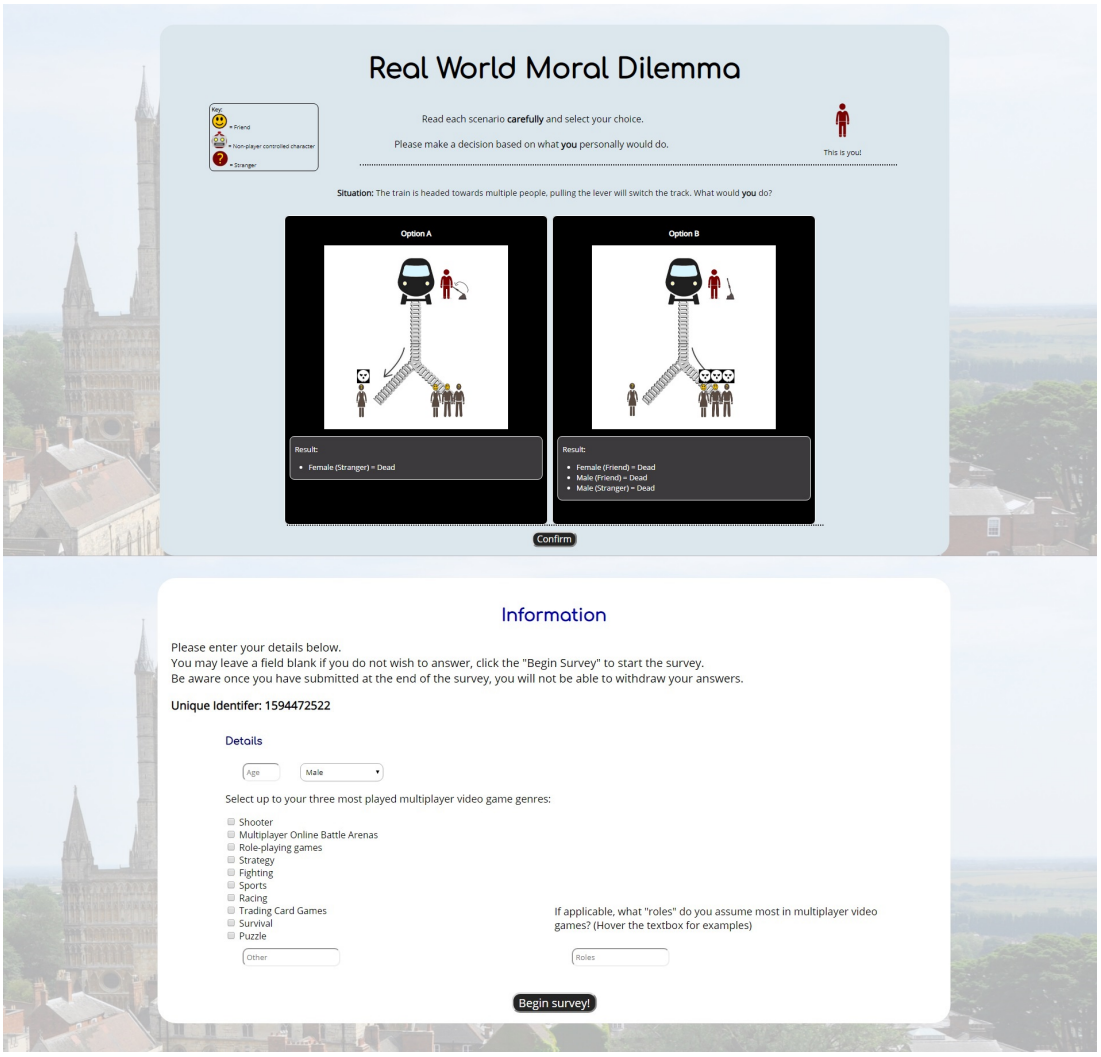
Figure 3.5: Example of the "Fat Man" dilemma with randomly generated characters.



survey they would be shown both real world and video game moral dilemmas, so all three would be used.

The demographics form was also designed so participants could enter their age, gender, most played game genres and game roles. This information was then saved to the Google Firebase. An example dilemma and the demographics form can be seen in Figure 3.6.

Figure 3.6: Example of a moral dilemma.



The next step was to recreate the Moral Foundations Questionnaire (MFQ) as a likert scale for both surveys. Once answered, the scores for each foundation are then tallied up for each foundation as the original questionnaire dictates. These can be seen in Figure 3.7.

Figure 3.7: Moral Foundation Questionnaires for video games and real world morality.

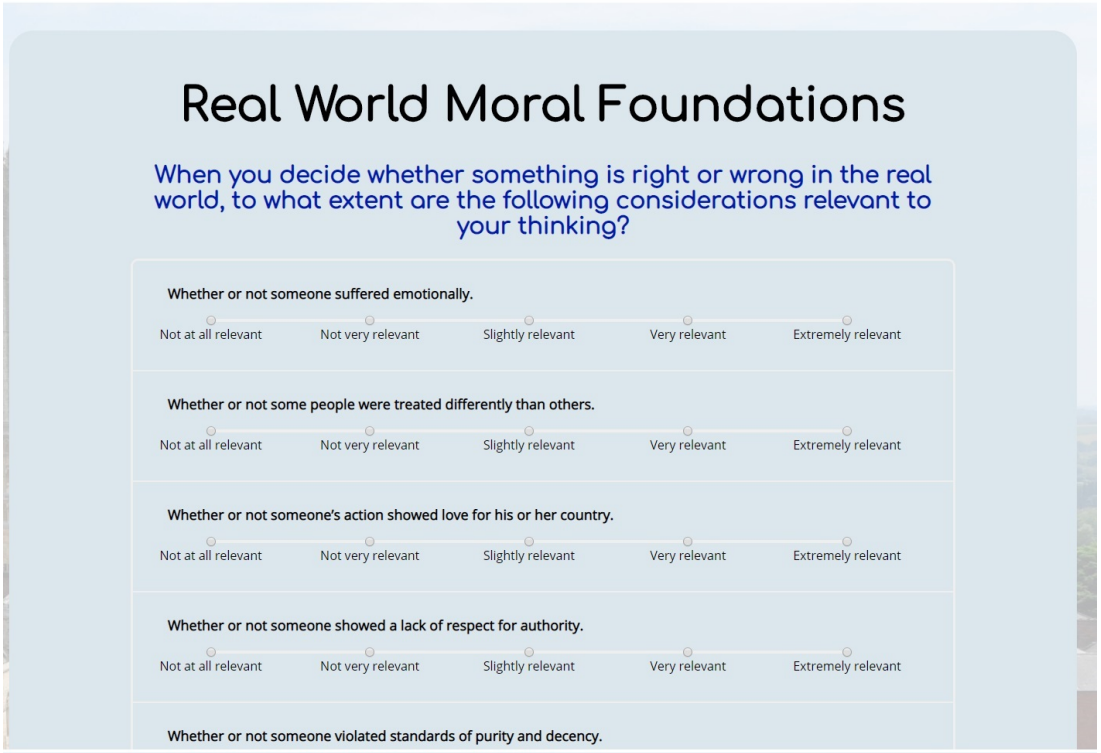
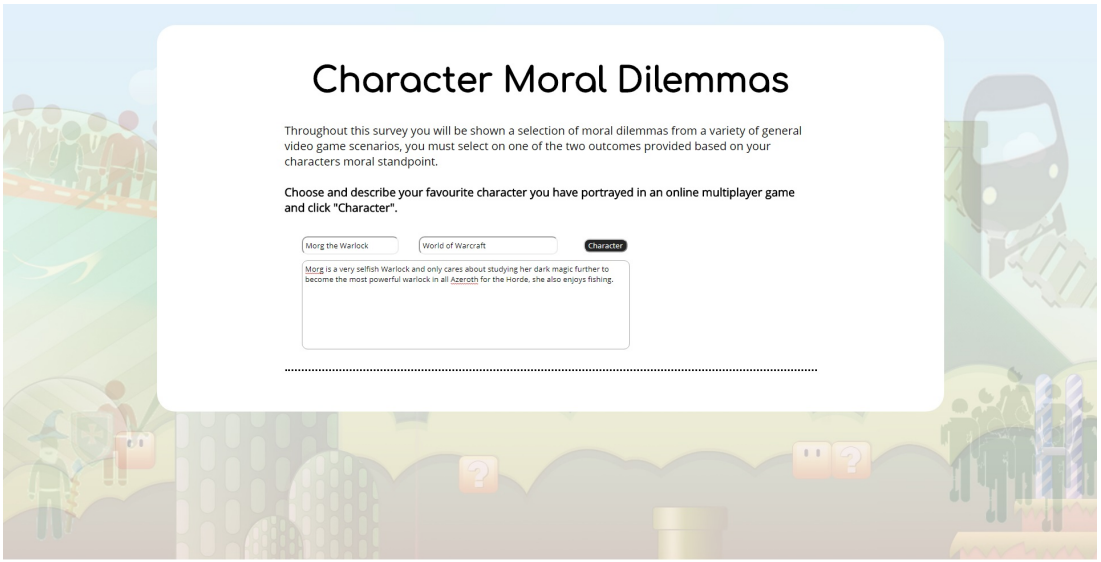


Figure 3.8: Character page for the video game character survey.



A character page was designed for the video game focused survey. They were asked to fill in the details of their online video game character, such as their name, game of origin and a short description of their character. An example can be seen in Figure 3.8. Throughout the survey, participants would be asked to answer the moral dilemmas as if they were role-playing their characters, using their perceived personalities as moral guidance for each scenario.

Once the participant submits their data, the Google Firebase would store all of the participants data in a structured JSON format. The survey would send the participants demographics, their MFQ results as well as their choices and outcomes in the moral dilemmas.

With the survey responses submitting all the necessary information to the established database, the next step was to test each aspect of the user interface which was done by using a third party for a pilot study. They would act as a participant to find any overlooked bugs or errors. After adjusting to feedback and fixing any bugs or errors which were noted, the web survey was ready to launch online.

3.3 Results

The survey was shared on social media (Facebook, Twitter, Reddit) and promoted via university services. There were 93 total responses, (62 male, 26 female; ages ranged between 17 and 65, mean = 24.93), and because participants were shown one of the two surveys, the personal survey received 61 responses, and the character survey received 32 responses. The most popular video game genres of all participants were role-playing games (69.9%), shooters (55.91%), strategy (38.71%) and multi-player online battle arenas (37.63%), while the least were sports (5.38%), fighting (6.45%), and racing (8.6%). Other genres included were adventure, rhythm and flight/space simulators.

3.3.1 Moral Dilemma Outcomes

Using the confidence intervals of proportion, the upper and lower limits for both problems can be used to measure the outcome of each dilemma for this study with 95% confidence, and a Chi Square Goodness of Fit test was used to determine the significance of the results. The difference in the amount of responses for each survey should be considered, and will be noted throughout the results.

Firstly, all dilemmas which contained unevenly sided choices were filtered and gathered to determine whether participants displayed any preference for the amount of people they would save, generally expecting a preference towards saving the majority in dilemmas. These results can be seen in Table 3.1.

For the personal survey, 83.52% of participants made a choice to save the majority, and the confidence intervals found that the percentage of participants who were likely to make a choice to save the majority was between 80.1% and 86.4% . When using chi square these results were found to be significant ($p<0.05$).

For the character survey, 83.69% of participants made a choice to save the majority when, and the confidence intervals found that the percentage of participants who

were likely to save the majority was between 78.9% and 87%. When using chi square these results were found to be significant ($p<0.05$).

This suggests similar to previous research, in hypothetical moral dilemmas saving the majority is often the preferred choice. The preferences don't differ between the surveys which further suggests that immersion as their character would not affect their moral decision making.

Table 3.1: Proportion of the "Save Majority" vs "Save Minority" choices in dilemmas.

	Personal Survey*	**Character Survey****
Save Majority	83.52%	83.69%
Save Minority	16.48%	16.31%

*n = 528, **n=282

The total amount of males and females that appeared in each dilemma were summed, and then used to calculate the amount which were killed or saved in both surveys. This was done to observe any gender preference that may have been present, generally expecting a preference to save any female characters. These results can be seen in Table 3.2

For the personal survey, 60.46% of the female characters were saved, and it was found that the percentage of female characters likely to be saved is between 57.4% and 63.44%. As for male characters, 58.47% of them were saved, and it was found that the percentage of male characters likely to be saved is between 55.4% and 61.47%. Using chi square these results were found to be significant ($p<0.05$).

For the character survey, 62.1% of the female characters were saved, and it was found that the percentage of female characters likely to be saved is between 57.83% and 66.17%. For the male characters, 61.33% of male characters were saved, and it was found that the percentage of male characters likely to be saved was between 57.17% and 65.33%. Using chi square these results were found to be significant ($p<0.05$).

While the difference between the findings is not significant, there was a slight difference in the percentages of genders saved. Overall, a higher percentage of female characters were saved in the both surveys, however it's worth noting that

Table 3.2: Proportion of male and female characters in dilemmas.

Gender		Personal Survey[1]	Character Survey[2]
Female[a]	Saved	60.46%	62.1%
	Killed	39.54%	37.9%
Male[b]	Saved	58.47%	61.33%
	Killed	41.53%	38.67%

1a) n = 1004, 2a) n = 517,
1b) n = 1009, 2b) n = 543,

despite a higher percentage of females being saved in the video game character survey, more male characters were saved. Also it is worth mentioning that due to the randomness of each dilemma load, there is a potential reasoning that the participant would be opting to choose to save the majority, where the male or female characters could have been.

To explore the potential gender preferences further, the dilemmas which were **evenly** weighted with males on one side and females on the other were considered. For example, if three males were in the left choice and three females were in the right choice. This was done to remove the potential reasoning of "saving the majority" in their choices. Due to the randomness of loading in the dilemmas, this resulted in a very small sample size, in the personal survey there were only 5 evenly weighted dilemmas, and it was found that in 3 of them the male character(s) were killed. In the character survey there were only 4 evenly weighted dilemmas and it was found that in each of them the female character(s) was killed. Although it's worth considering that the context of the dilemma and some of these dilemmas containing children or different characters could have had a bigger influence on the decisions made.

The different character types from each dilemma were also gathered and used to calculate if any preference for each type was shown. From the personal survey this included "Friends" and "Strangers" for the dilemmas focused on the real world, and "Friends" and "NPCs" for the dilemmas focused on video games. From the video game character survey this included "Friends" and "NPCs" as this survey only used the video game character for dilemmas which focused on video games.

Table 3.3: Proportion of each character type in the dilemmas.

Character		Personal Survey[1]	Character Survey[2]
NPC[a]	Saved	60.3%	56.96%
	Killed	39.7%	43.04%
Friend[b]	Saved	60.52%	64.01%
	Killed	39.48%	35.99%
Stranger[c]	Saved	52.38%	N/A
	Killed	47.62%	N/A

1a) n = 592, 2a) n = 539,
1b) n = 1041, 2b) n = 553,
1c) n = 210,

A general expectation would be that "Friends" would be the most preferred where "Strangers" and "NPCs" being the least preferred where applicable. These results can be seen in Table 3.3

For the personal survey, 60.3% of the NPCs were saved, and it was found that the percentage of NPCs likely to be saved was between 56.3% and 64.16%. It was also found that 60.52% of friends were saved, and it was found that the percentage of friends likely to be saved was between 57.52% and 63.45%. Also, 52.38% of strangers were saved and the percentage of strangers likely to be saved was between 47.72% and 57%. Of these results, using Chi Square found the "NPC" and "Friend" results to be significant while the "Stranger" result was not ($p<0.05$).

For the character survey, 56.96% of the NPCs were saved, and it was found that the percentage of NPCs likely to be saved was between 52.75% and 61.08%. Whereas 64.01% of friends were saved, and it was found that the percentage of friends likely to be saved was between 59.93% and 67.9%. Of these, using Chi Square found the "NPC" and "Friend" results to be significant, but the "Strangers" results were not.

As expected there was a significant preference shown towards the "Friend" characters in both surveys, however in the personal survey a strong preference to save the NPC was also found. This suggests that individuals prefer to save their friends and even non-player controlled characters in video games over people they do not know.

Table 3.4: Proportion of children in dilemmas.

	Personal Survey*	**Character Survey****
Children saved	61%	63.66%
Children killed	39%	36.34%

*n = 900, **n=465

As children were used as characters in the dilemmas in each survey, the results also explored any preference towards saving children. This was done by observing any time a child was present in a dilemma, and whether the child was saved or not. The results can be seen in Table 3.4.

In the personal survey, it was found that of all children, 61% of children were saved, and it was found that the percentage of children likely to be saved is between 57.1% and 63.48%. Using Chi Square these results were found to be significant ($p<0.05$).

In the character survey, it was found that of all children, 63.66% of children were saved, and it was found that the percentage of children likely to be saved is between 59.19% and 67.9%. Using Chi Square these results were found to be significant ($p<0.05$).

This suggests that when an individual is presented with a child in a moral dilemma, there is a significant preference to try to save them, although it should be noted that due to the randomness of each dilemma load, there is a potential reasoning that the participant would be opting to choose to save the majority, where the children characters could have been.

To explore this further, scenarios which included children and adults in each choice of the dilemma were also considered, to determine whether the maximum number of children saved was prioritised or not. The results can be seen in Table 3.5.

In the personal survey, it was found that of all children, the percentage of participants who prioritised the maximum number of children was 76.55%, and it was found the percentage likely to prioritise the most children is between 81.77% and 91.13%. Using Chi Square these results were found to be significant ($p<0.05$).

Table 3.5: Preferences for maximising the amount of children saved.

	Personal Survey*	**Character Survey****
Maximum prioritised	76.55%	78.09%
Maximum not prioritised	23.45%	21.91%

*n = 388, **n=178

In the character survey, it was found that of all children, the percentage of participants who prioritised the maximum number of children was 78.09%, and it was found that the percentage of participants who are likely to prioritise the most children is between 71.89% and 83.37%. Using Chi Square these results were found to be significant ($p<0.05$).

This suggests that when children and adults are presented in either choice of a moral dilemma, there is a significant preference shown towards saving the maximum number of children where possible. Although these dilemmas contained children in one choice and adults in the other choice, they still were not necessarily evenly weighted choices which means there is still a potential that the idea of "saving the majority" played a role in the choices made.

To expand on this, the dilemmas which were **evenly** weighted with children on one side and adults on the other were considered. For example, if two children were in the left choice and two adults were in the right choice. This was done to remove the potential reasoning of "saving the majority" in their choices. Due to the randomness of loading in the dilemmas, this resulted in a very small sample size. In the personal survey, there were only 4 dilemmas which were evenly weighted, and the results for these show that from 3 of these cases the child(s) were saved. In the character survey, there were only 4 dilemmas which were evenly weighted and the results for these found that in 3 of the 4 cases, the child(s) was saved. This suggests that when evenly weighted choices are given, the life of a child is valued more than an adults, although it's worth considering that the context of the dilemma potentially influences the decisions made.

Table 3.6: Save Majority vs Save Minority choices between participant genders.

	Personal Survey*		**Character Survey****	
	Male[1a]	Female[1b]	Male[2a]	Female [2b]
Save Majority	94.44%	100%	100%	100%
Save Minority	5.56%	0%	0%	0%

1a) n = 36, 1b) n = 22
2a) n = 26, 2b) n = 4

3.3.2 Gender Differences

To further explore the differences between participant genders, their responses were gathered into gender-based groups. They were then analysed to determine if the participants displayed any preference for saving the majority or saving the minority across the participant gender. The proportion of each group can be seen in Table 3.6.

Using the Chi Square Goodness of Fit test, the results found that the male and female participants (1a, 1b, 2a, 2b) preference for saving the majority were statistically significant ($p<0.05$). This suggests that males and females prefer saving more lives in hypothetical situations for both real world and video games dilemmas. This further suggests that there is little difference in moral decision making between real world and video game dilemmas.

It can be seen that there is a clear preference for saving the majority in hypothetical moral dilemmas across both real world and video game scenarios, for males and females.

To explore gender preferences between different gendered participants, as previously mentioned, there are a small number of **evenly** weighted dilemmas which can be used which is due to the randomness of how the dilemmas are loaded.

From the personal survey, the 5 evenly weighted female vs male dilemmas used found that 3 of those were male responses, 2 were female responses. Of the male participants, they chose to save the female twice, and save the male once. Of the female participants, there was an even split as one response saved the male

characters and the other saved the female character. From the character survey, the 4 evenly weighted female vs male dilemmas used found that 1 of those was a female response, the other 3 were male responses. All of the responses to these 4 evenly weighted dilemmas chose to kill the female, although it is worth noting that this included children and different characters which could have affected the results.

To explore any child preference between different gendered participants, again, there was a small number of **evenly** weighted dilemma between adults and children which will be used. This is due to the randomness of how the dilemmas are loaded.

From the personal survey there are 4 evenly weighted children vs adult dilemmas, where the results found that 2 of them are male responses and 2 are female responses. The male participants had 1 response choose to save the children and the other chose to save the adult. Both female participants chose to save the children. From the character survey there are 4 evenly weight children vs adult dilemmas, where the results that all of them are from male participants, in 3 of those responses they chose to save the child, and in 1 of those responses they chose to save the adults. It is worth mentioning that the character and gender of these characters could have played a role in their choices as they were each different due to the random load of the dilemmas.

Overall, no significant gender differences were found in moral decision making due to the small sample sizes, nor in preferences of saving children over adults, however a significantly large amount of each gender preferred making choices to save the majority.

3.3.3 Moral Foundation Questionnaire

The MFQ results were analysed to determine which of the foundations were prominent in participants, and compared across both surveys. The average results of each can be seen in Table 3.7.

Calculating the results for the MFQ results of the personal survey found that the "Fairness/Reciprocity" (μ=23.10, μ=20.84) and "Harm/Care" (μ=23.03, μ=20.41) foundations were the most commonly valued while the "Purity/Sanctity" (μ=15.02, μ=13.77) foundation was the least commonly valued.

Calculating the results of the MFQ for the character survey found similar results, showing that the "Fairness/Reciprocity" (μ=22.53, μ=21.09) and "Harm/Care" (μ=21.94, μ=20.56) foundations were the most commonly valued while the "Purity/Sanctity" (μ=14.69, μ=15.00) foundation was the least commonly valued again.

When the means of each foundation were compared across surveys, the results found no significant differences ($p<0.05$) between them. This suggests that role-playing as their video game character does not alter their moral foundations from their personal moral foundations.

When the averages of each foundation were compared across the different focused MFQs, only two significant ($p<0.05$) comparisons were found and these were the comparisons of the real world and video game Harm/Care and Fairness/Reciprocity foundations from the personal survey. No others were found to be significant. This suggests that the only difference between an individual and how they behave in video games is in their Harm/Care and Fairness/Reciprocity foundations.

The results show that averaging across both surveys found the "Fairness/Reciprocity" (μ=22.90, μ=20.92) and "Harm/Care" (μ=22.66, μ=20.46) foundations to be the most commonly valued while the "Purity/Sanctity" (μ=14.90, μ=14.19) foundation was the least commonly valued.

Common findings in research exploring these moral foundations within video games show that certain foundations share correlations with feelings elicited through video games, such as guilt [88] and care [1] with the "Harm/Care" and "Fairness/Reciprocity" foundations, and response to authority with the "Authority/Respect" foundation. These correlations suggest that there are few differences between how an individual makes moral decisions in the real world and how they do through their characters in video games. This is supported

Table 3.7: Averages of results from each focus of MFQ, from each survey, and overall averages across both surveys.

Moral Foundation	MFQ Focus*	Personal Survey	Character Survey	Averages over both
Harm/Care	RW	23.03	21.94	22.66
	VG	20.41	20.56	20.46
Fairness/Reciprocity	RW	23.10	22.53	22.90
	VG	20.84	21.09	20.92
In-group/Loyalty	RW	16.20	17.38	16.60
	VG	16.82	17.88	17.18
Authority/Respect	RW	17.30	18.19	17.60
	VG	16.00	17.53	16.53
Purity/Sanctity	RW	15.02	14.69	14.90
	VG	13.77	15.00	14.19

*RW = Real World, VG = Video Game

through the findings shown in Table 3.1, where a majority of participants chose the utilitarian outcome across both surveys.

3.3.4 Video Game Characters

For the video game focused survey, participants were asked to name and describe one of their video game characters which would then be used as the focus in the dilemmas throughout the survey. Their characters descriptions would then be interpreted to determine whether their character was morally "Good" or "Bad", and whether their choices in the survey aligned with their described personas. This survey also gave users an MFQ for both their own personal views, and their characters perceived views. To determine whether their moral decision making was affected by their immersion as their characters, these were compared and their choices throughout the survey as their character were recorded.

For the purpose of defining a "Good" and "Bad" character, the descriptions which provided a clear alignment for their character were used to determine the groups of characters to analyse. Examples of a clear alignment of "Good" involved descriptors of generic heroic or pro-social behaviours acts such as saving others, trying to do the right thing, and including positive character traits focused

on things such as being selfless, friendly, loyal and more. Examples of a clear alignment of "Bad" involve the opposite, acts of evil or anti-social behaviours such as terrorism, theft, and include negative character traits focused on things such as being selfish, notorious or extremely violent.

Using these ideas of "Good" and "Bad", there were 11 "Good" characters and 8 "Bad" characters. This means the other 13 characters were not assigned an alignment, due to an ambiguous or missing description.

When these characters and their alignments were compared with the choices made throughout their survey, there were very few differences found between each alignment of character. Overall a majority of "Good" and "Bad" characters preferred to save the majority in the dilemmas, where it may have been expected that the "Bad" characters would perhaps choose to kill as many people as possible if their character were extremely violent. However saving the majority appeared to be the preferred choice for both "Good" and "Bad" characters.

Notably, one "Bad" character was described as a *"Crazy terrorist who likes chaos and mayhem."* and would be expected to cause as much damage as possible. This was reflected in their choices as in 8 of their 10 choices they resulted in the larger possible number of deaths despite the characters or context of the dilemma. This absolutely reflects their characters personality of "liking chaos and mayhem".

On the other side of this argument there were two "Good" characters named Linden and Medic described as *"fair and selfless"* and *"Self-sacrificing and compassionate"* respectively, these characters would be expected to make choices which involved selfless acts or self-sacrifice. The "Abandon" dilemma (Appendix A.1) involved the sacrifice of a party member to complete a quest, and two of the dilemmas involved a form of self sacrifice in the "Lifeboat" and "Zombie" dilemma (Appendix A.7 and A.10). The expected outcomes for these dilemmas might be that they would choose to fail the quest, and be willing to sacrifice their self instead of causing harm to another respectively. Both Linden and Medic chose to fail the quest rather than sacrifice a team member, however only Linden chose to sacrifice their self when given the option where Medic chose to sacrifice

the one which does not reflect a "self sacrificing and compassionate" personality, although it could be argued that Medic was considering the lives of the others in the dilemma with them.

Both of the MFQ results were also compared with the characters alignments to explore any notable differences and the most prominent foundations were calculated for each character. Very few differences were found between the "Good" and "Bad" characters, as the Harm/Care foundation was found to be the most prominent across both alignments. One difference found that the Fairness/Reciprocity foundation was more prominent in "Good" characters and was also reflected in the participants self-focused MFQ. This could reflect upon the participants decision to play as "Good" characters as this foundation is *"related to the evolutionary process of reciprocal altruism. It generates ideas of justice, rights, and autonomy"* [146] where the "Good" characters are mostly focused on the idea of doing the right thing, heroism and selflessness. However ultimately there were no significant differences found between the MFQ results of the differently aligned characters.

The MFQ results of the participant were also compared to that of their characters to explore any differences that may relate to their personal moral foundations opposed to their characters. It was found that the Harm/Care foundation and the Fairness/Reciprocity foundation were the most common across both questionnaires again, and the foundations which were most prominent in personal questionnaire were consistent with the most prominent foundation in the character questionnaire showing no differences. There were no significant differences were found between moral foundations between a participant and their character which suggests either participants do not differ their moral foundations between the real world and their character, or that their character is designed to reflect their moral foundations.

Given these findings, while a few participants made choices reflective of their characters perceived personas as previously mentioned, overall they suggest that immersion in video games as a character does not change their moral decision making from their personal decision making nor their moral foundations. While this study focuses on moral decision making with an individual and their character

using hypothetical moral dilemmas, this prompted ideas of how to investigate moral decision making in a practical and immersive setting used for the second study.

Chapter 4

Designing and Implementing Moral Dilemmas in Virtual Reality

As the first study focused on immersion in a video game using hypothetical moral dilemmas, the second study used a more immersive setting to investigate an individuals moral decision making using moral dilemmas within a virtual reality (VR) environment.

The second study did this by simulating moral dilemmas using VR, where morality measures were used to explore the participants moral foundations, decision making, and competence. The previously mentioned "Trolley Problem" and the "Fat Man Problem" were used as the moral dilemmas for the simulation, each with three different variations. These variations can be seen in Table 4.1, they were V1 (Original - 1 person vs 5 people), V2 (Gender- Male vs Female) and V3 (Animal - Humans vs non-Humans):

Table 4.1: Variations

Variation	Trolley Problem	Fat Man Problem
Original (V1)	1 - 5	1 - 5
Gender (V2)	4 - 4	1 - 4
Animal (V3)	3 - 3	1 - 3

Note: (V1), (V2) and (V3) are used to represent the variation in context for one of the three possible conditions for participants.

In each variation, all characters were randomised. The side for each character type was also randomised (e.g. For the Gender variation, men are randomly placed on either the straight or the forked track in the Trolley Problem, and the women are placed on the other). There were three possible conditions, starting on one of the three variations and cycling through the next two variations, condition A (V1 →V2 →V3), condition B (V2→V3→V1) or condition C (V3→V1→V2). Before the VR dilemmas, participants were asked to complete the Moral Foundations Questionnaire (MFQ) [146] and the first half of the Moral Competence Test (MCT) [63] to gather results on their moral foundations, as well as their moral competence results. They are then given the second half of the MCT after the VR scenarios to see if their moral competence had been affected.

The participants age, gender, their MFQ and MCT results, as well as the condition that was used and the result from each variation and dilemma were all recorded throughout the study. Any notable behaviours and quotes that indicate reasoning or judgement behind their behaviour were also compiled. The data has then been analysed to find the most chosen outcomes from both dilemmas in each variation. The level of "involvement" from the participants across each scenario, and any differences in decisions between participant gender were also analysed, as well as the MCT C-scores and the MFQ foundations to find any trends between behaviours.

4.1 Design

The aim of this study is to investigate an individuals moral decision making when involved in an immersive moral dilemma. The first thing to decide on was which moral dilemmas would be replicable and immersive while being appropriate for a study in regards to ethical concerns. The sources for both real world [139]–[141] and video game moral dilemmas [142]–[144] used in the first study were revisited to find an appropriate moral dilemma. The "Trolley Problem" and the "Fat Man problem" were decided as the best fitting for this study, as these are

two well known moral dilemmas that have been used in previous studies both hypothetically [38]–[40] and in simulations [128], [129], [131].

4.1.1 The Platform

There were three platforms discussed for this study: Virtual Reality (VR), Augmented Reality (AR) and real life.

Firstly, if these moral dilemmas were recreated in real life there would be two major concerns involved with the briefing of the study. If you chose not to debrief then the immense ethical concerns are that the study could potentially traumatise participants by thinking that they may have witnessed or taken a role in a persons death, whereas if you choose to brief them about the study then demand characteristics may play a role, and their "moral" decisions would bias and they may not use their moral thought process at all, they could view it as a game. Recreating moral dilemmas in real life has been explored by educator and entertainer Michael Stevens [16] where they ask several ethical institutions for approval of a legitimate scientific study of recreating the "Trolley Problem" in the real world, to which they all agree they would not allow it due to the many ethical concerns including potential trauma. While it was discussed it was instantly dismissed as a possibility for this study.

As for AR, the idea involved setting up an environment that would be capable of recreating a moral dilemma in the real world. The virtual subjects involved in the dilemma would be "augmented" to the real world and the simulation would begin when the participants were ready. This would create an immersive environment suitable for the study, however it would contain similar ethical concerns as the real world example if the scenarios were created to a lifelike standard.

VR was the ideal platform for this study, as it is one of the most immersive experiences that exists and studies have supported this idea as *"people tend to respond to situations and events as if they were real, despite the fact that they are consciously aware of the situation's artificiality"* [130]. This is where the VR

would allow for an immersive environment that would provoke a realistic moral response for the study. VR also reduces the intensity of the ethical concerns that would come from recreating moral dilemmas in the real world or AR. These concerns are not entirely ignored in VR but they can be considered throughout the design and implementation to minimise any possible issues, Navarrete [128] explained the ethical concerns through their study as the *"experiments that subject research participants to contexts in which extreme harm to others could be realized. However, recent advances in immersive virtual environment technology allow for such studies to be conducted in artificial, yet realistic, 3-D digital worlds."*

4.1.2 The Dilemmas

The "Trolley Problem" and "Fat Man Problem" are commonly used throughout existing research in moral decision making, research that uses these moral dilemmas [128], [129], [131], [147], [148] provided a premise for the design of the VR implementations. The potential upset and trauma of the participants was considered throughout the design of these dilemmas used for the study.

The initial design for the "Trolley Problem" had the participant in VR stood at the side of a forked train track in a realistic environment. There is a trolley at the far end of the track and the participant is stood next to a lever which controls the direction of the trolley, there are a number of people trapped on each side of the track, on the straight track there are 5 people and on the forked track there is 1 person. The participant would then be told about the situation in front of them, they would be told *"The trolley is currently headed down the straight track"*. They will be instructed on how they can interact with the environment around them, and allow them time to feel comfortable in the world. The trolley would begin to approach down the track after a short amount of time and the participant would have to decide whether they would pull the lever to change the track or not. It's important that no leading statements are used when explaining the scenario to participants to avoid leading any of the participants decisions, as this has been found to affect how individuals make their decisions in moral dilemmas based on the "doing vs allowing harm" distinction [37], [38].

The initial design for the "Fat Man Problem" had the participant in VR stood on a bridge over a straight train track, they are stood next to a rotund individual with large mass. On one side of the bridge there is a trolley far down the track, on the other side of the bridge are 5 people on the track. The participant is told that the person on the bridge is large enough that they would stop the trolley and they themselves can't jump off the bridge. They will then be instructed on how they can interact with the environment around them, after a short amount of time the trolley would begin to approach down the track, the participant would then have to decide whether or not they would push the person off of the bridge to stop the trolley. Again, it is important that no leading statements are used when explaining the dilemmas to participants to avoid leading the participants decisions in the moral dilemmas.

4.2 Implementation

The moral dilemmas were created in Unity 2017.1.1f1[1] using the Unity store asset "Train Trax" as the environment, the character models are from Adobe Mixamo[2] and the trolley model was created using Blender. To use the Oculus Rift and Oculus Touch Controllers with the moral dilemmas, unity needed the Oculus utilities for Unity "OVRPlugin", "Oculus Platform SDK" and "Oculus Avatar SDK" plug-ins.

Initially the "Trolley Problem" and "Fat Man Problem" were recreated using the "Train Trax" assets, using the individual track pieces to replicate the layout in each problem. The surrounding environment was designed to replicate a realistic town environment to improve immersion.

The original problems used a trolley car in their depictions, however for the sake of realism in the "Fat Man Problem" a slightly smaller cart model was designed for this study, as there is unlikely to be a realistic individual who would have enough mass to stop a trolley. The smaller cart model was used in an attempt to

[1] Unity Technologies, Unity 3D, 2018
[2] Adobe Systems Incorporated, Mixamo, 2018

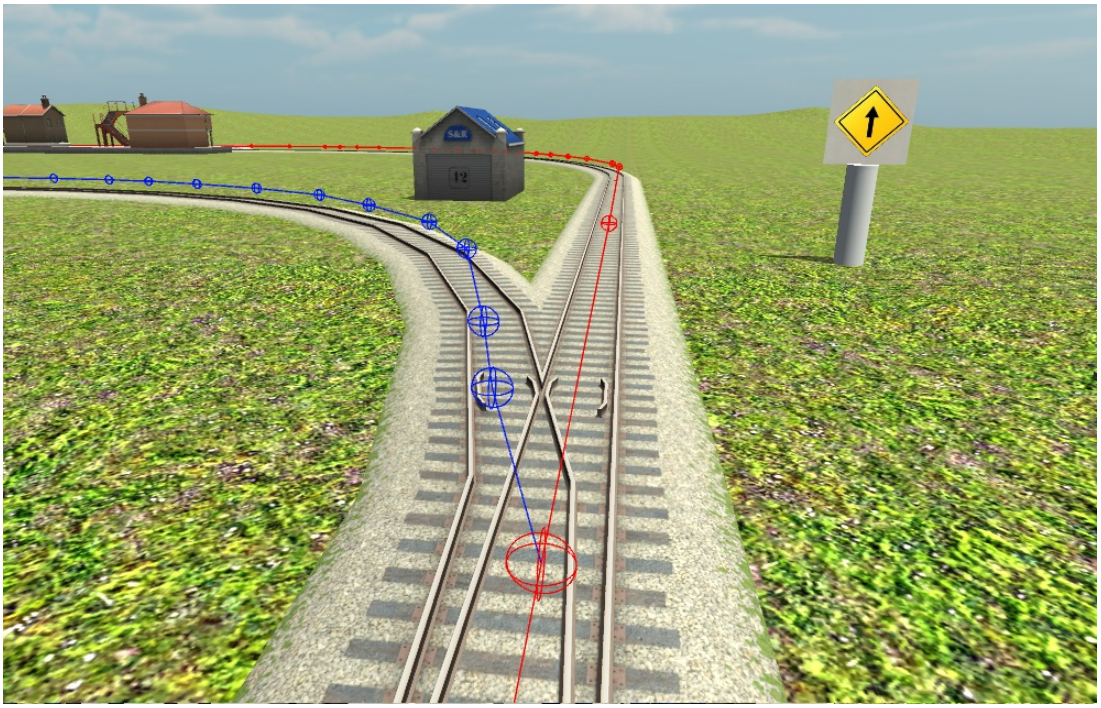
increase the realism of the scenarios, appropriate sound effects were also used to indicate movement collisions. The cart can be seen in Figure 4.1.

Figure 4.1: Trolley model redesigned and textured.

The next step was to implement the movement for the trolley, which uses a basic car AI system for the trolley paths and movement [149], [150]. In the "Trolley Problem" the two paths were overlaid onto the train tracks for the trolley to follow from its starting position, and a boolean variable was introduced with appropriate restrictions which would allow the trolley to change which track it follows until it reached the fork in the track. In the "Fat Man Problem" one path was used to direct the trolley under the bridge. This can be seen in Figure 4.2.

The character models were gathered from Adobe Mixamo, they were downloaded with appropriate animations for being idle, scared and hit by the trolley. Example characters can be seen in Figure 4.3, and all characters used can be found in Appendix B. These characters were then loaded into the world space onto the tracks or bridge positioning them apart dependent on how many characters were loaded, it was also designed so no characters would be repeated. The appropriate animations were used for each moment in the scenario, idle as the default, scared as the trolley approached down their respective track, and hit when the trolley hit them. A small blood particle effect and scream sound effects were also used for each character when hit. When the scenarios are completed they will load into the next scenario after a brief delay.

Figure 4.2: Trolley pathing nodes, operated by switching bools.



In the "Trolley Problem", the participant was placed in front of a lever which would change the direction of the trolley down the track, they could grab the lever with the touch controllers. A sign with an arrow was used to indicate what track the trolley was currently travelling down, and would change based on the levers current position. There was also a sign with a brief explanation of the current situation which they could read if they needed to be reminded of their task. In the "Fat Man Problem" the participant was positioned on the bridge behind the "Fat Man", and the touch controllers were used to reach out and push the character from the bridge.

Practice scenarios with no characters were designed to familiarise participants with the controls without showing the core of the study. In the "Trolley Problem" participants had to change the lever to the other side and back using their touch controllers to see the effect on the trolley path, in the "Fat Man Problem" participants had to push a weighted crate from the bridge onto the track using their touch controllers, where the train would be stopped from the weight of the crate. These can be seen in Figure 4.4.

Figure 4.3: Example of character models used, people (left) and penguins (right).

Figure 4.4: Practice scenarios for each dilemma.

Different variations were considered through the design that would be appropriate for the study. The three final variations used were titled "Original" (V1) with five random characters on one side of the dilemma and one random character on the other, "Gender" (V2) with an equal amount of male and female characters on either side of the dilemma, and "Humans vs Non-Humans" (V3) with an equal amount of human and animal characters on either side of the dilemma. Both dilemmas used these variations.

In V1 the character array used all of the human character models, where they were randomly selected and loaded into the scenario. The side of the scenario they were loaded on was also randomly selected to explore if the impact of involvement or the outcome is more important to the participant, this is a commonly explored

debate in moral behaviour research [38], [42]. In V2 the character array used an array of male character models and female character models, where the models and side were randomly selected and loaded. In V3 the character array used an array of all human character models and an array of penguin models, where the models and side were randomly selected and loaded. Penguin models were chosen as they are bipedal animals where models and animations were readily available.

4.3 Methodology

Firstly, it was important to consider the ethical implications of this study, particularly due to the use of VR. Participants were given information on the study and told what they would be required to do, along with a participant unique reference. They were then given instructions on how to safely use the VR equipment and asked about their familiarity with VR, if happy to continue, a consent form was then given. They were also informed of their right to withdraw at any time throughout the study. Participants were then asked to fill out the Moral Foundations Questionnaire (MFQ) on a paper copy as well as the first half of the Moral Competence Test (MCT). These study materials and the MFQ can be found in Appendix C, but the author of the MCT has requested it not be shared without their permission[3]. The MFQ and MCT were used to learn more about a participants moral foundations and competence respectively to explore whether these theories are related to moral decision making. For this part of the study, there would be minimal interference from the researcher as they answered the questionnaires to avoid any accidental bias or influence of answers.

Once the questionnaires were completed, participants were then positioned for using the VR in the designated space and fitted with the VR headset. They were given time to adjust the headset and become comfortable with their environment, once comfortable they were ran through the practice scenarios to familiarise them with the controls. They would then begin the study, the situation in front of them would be described using non-leading phrasing to avoid any influence on

[3]Georg Lind, Moral Competence Test (MCT), 1977-2019

their choices. The scenario would then begin, where all their notable behaviours and comments from then would be written down. Their choice would then be recorded before moving onto the next dilemma, this would be repeated for all dilemmas.

Each participant engaged in all three variations for both scenarios of the "Trolley Problem" and the "Fat Man Problem". Each participant was assigned one of three possible conditions, A, B or C. The condition would determine which variation the participant would start on. Condition A cycled V1 →V2 →V3, condition B cycled V2 →V3 →V1 and condition C cycled V3 →V1 →V2, this was to control any potential order effects and explore whether they would impact the study.

When the dilemmas were complete they would then be taken out of the VR space and given the second half of the MCT to complete. After completing the study, participants would be asked about any further comments or questions they wanted to share about the study.

Chapter 5

Results of Moral Dilemmas in Virtual Reality

A total of 40 participants were gathered for this study (24 male, 16 female; ages ranged between 19 and 28, mean = 21.38). There were 14 participants for condition A (1-5 -> Gender -> Animal), and 13 for conditions B (Gender -> Animal -> 1-5) and C (Animal -> 1-5 -> Gender). Their results will each be analysed with regards to the outcomes, character preferences, gender differences, behavioural differences and moral measures (moral foundations and competence).

5.1 Moral Dilemma Outcomes

The overall results for every variation of each scenario can be seen in Table 5.1. Using the confidence intervals of proportion, the upper and lower limits for both problems can be used to measure the outcome of each dilemma for this study with 95% confidence. The Chi Square Goodness of Fit test was also used to determine the significance of each result.

For the "Trolley Problem", 87.5% of people chose to save the 5, and the results show that the percentage of participants who are likely to save the 5 is between 73.9% and 95%. In V2, the results found that 80% of people chose to save the female, and the results show that the percentage of participants who are likely to save the females is between 65.2% and 89.5%. The same percentage was found for those showing a preference to save the humans in V3. Using the Chi Square

Table 5.1: Confidence Intervals of Proportion for VR dilemmas.

Variation	Character Saved	Trolley Problem	Fat Man Problem
V1	1	0.125	0.425
	5	0.875	0.575
V2	Female	0.80	0.575
	Male	0.20	0.425
V3	Human	0.80	0.80
	Non-Human	0.20	0.20

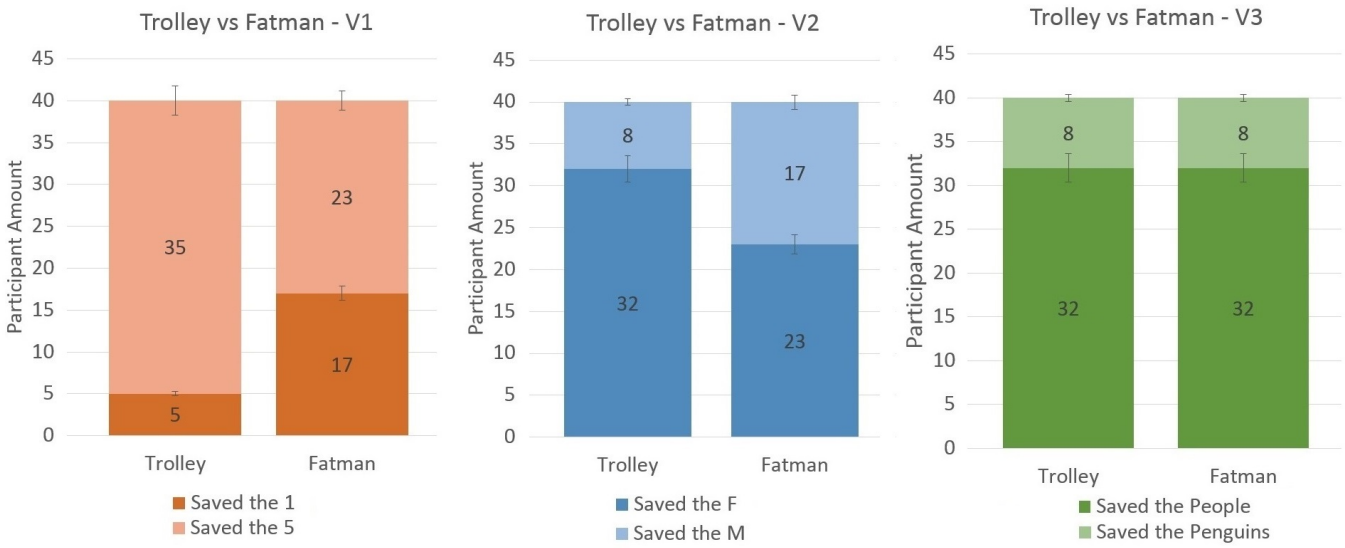
n = 40

Goodness of Fit test, it was found that all of the "Trolley Problem" results were significant ($p<0.05$). This suggests that these preferences are not determined by chance. It also suggests that the moral decisions of saving a larger amount of people, females over males and humans over animals are the preferred options in the "Trolley Problem".

For the "Fat Man Problem", 57.5% of people chose to save the 5, and the results show that the percentage of participants who are likely to save the 5 in V1 drops to between 42.2% and 71.5%, the same percentage was found for those showing a preference to save the female in V2. For V3, 80% of people chose to save the humans as they did in the "Trolley Problem". Using chi square the only significant ($p<0.05$) result was the preference for saving the humans in V3. This suggests that the preference shown for humans over non-humans was not found by chance, and shows that individuals value a human life over an animals life when given a moral dilemma. However, while saving the 5 in V1 and saving the females in V2 were still the preferred choice, they were not found to be significant ($p<0.05$) as both returned P-values of 0.343. This suggests that the difference in significance between saving more lives and saving females over males is impacted by the action required in the dilemma when comparing the "Trolley Problem" and "Fat Man Problem".

These results can also be seen in Figure 5.1, where previous research into these moral dilemmas have found similar results between the two dilemmas [39].

Figure 5.1: Outcomes of each Moral Dilemma in every variation.



5.2 Involvement versus Omission

To explore whether involvement played a role in the decision making, the action of each participant was recorded and grouped by "Involvement" or "Omission" from all 120 scenarios.

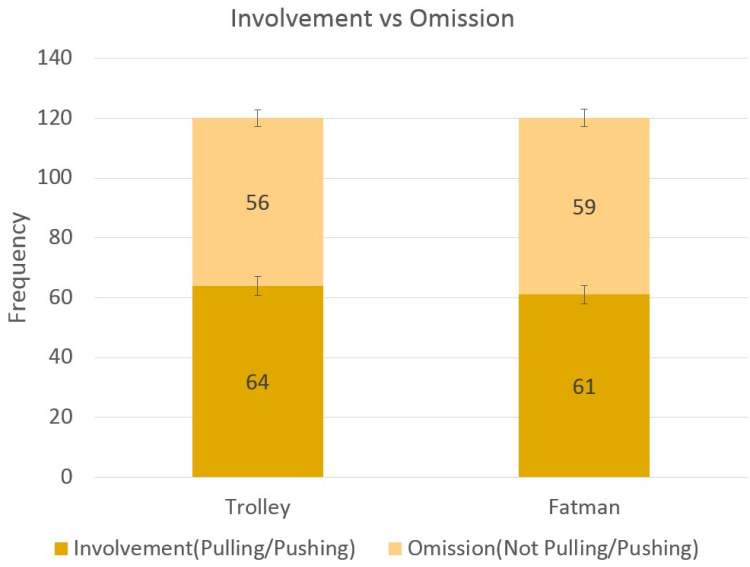
The Involvement group recorded when participants pulled the lever in the "Trolley Problem" and pushed a character from the bridge in the "Fat Man Problem", where the Omission group recorded when participants didn't involve themselves in the moral dilemma.

In the "Trolley Problem", 53.33% of participants chose to pull the lever. The confidence intervals also show the percentage of participants who are likely to pull the lever is between 44.4% and 62%. In the "Fat Man Problem", 50.83% of participants chose to push the character from the bridge. The confidence intervals also found that the percentage of individuals who are likely to push a character is slightly less and between 42% and 59.6%. Chi square found that these results are not significant ($p<0.05$) with a P-value of 0.465 and 0.855 respectively. These results can be seen in Figure 5.2.

This suggests that the action involved in the dilemma did not play a significant role when making their choices. This could be due to the realisation that the involvement in VR moral dilemmas has little consequence in the real world. The

participants decisions appeared to be more influenced by the characters presented in the dilemma, as the side which the characters were on was randomly decided.

Figure 5.2: Involvement and Omission results for each dilemma



5.3 Gender Differences

To explore gender differences, the participants and results from all scenarios were gathered into gender-based groups. Statistical analysis was used to determine whether there was any significant differences, patterns or preferences displayed across participant gender.

For the "Trolley Problem" both male and female participants displayed a significant preference for saving the 5 in V1, the female in V2 and the humans in V3. The lowest preference percentage was for male participants in V2 saving females, which was 75%. This means the proportion of participants likely to save females was between 55.1% and 88%. Using the Chi Square Goodness of Fit test, it was found that all of these preferences were significant ($p<0.05$), which suggests that the gender of the participant makes no significant difference on the moral decisions made in the "Trolley Problem".

For the "Fat Man Problem" there were less clear preferences found. While saving the females and humans was still the most common decision found across both

genders, female participants showed a strong preference towards saving the 1 in V1, where the men still showed a stronger preference to save the 5. Using the Chi Square Goodness of Fit Test, it was found that only 2 of these 6 preferences were significant ($p<0.05$) which were men saving the 5 in V1, and men saving people in V3.

Figure 5.3: Gender comparison of results for the Fat Man Problem in V1.

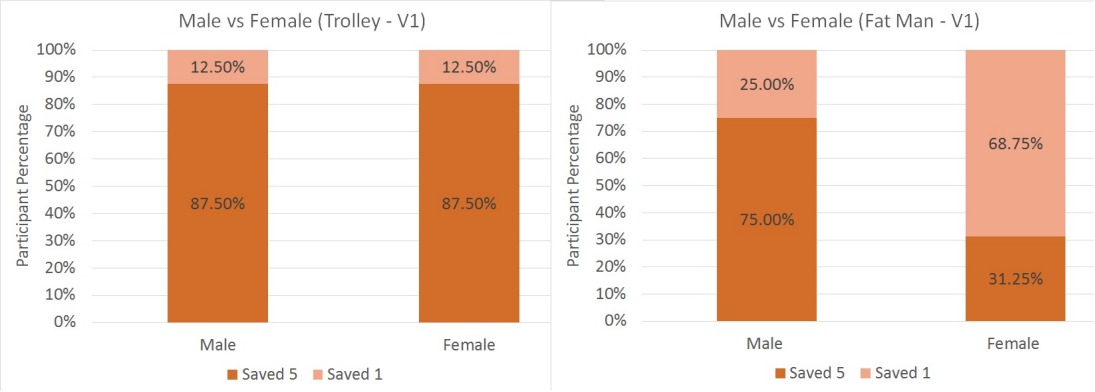
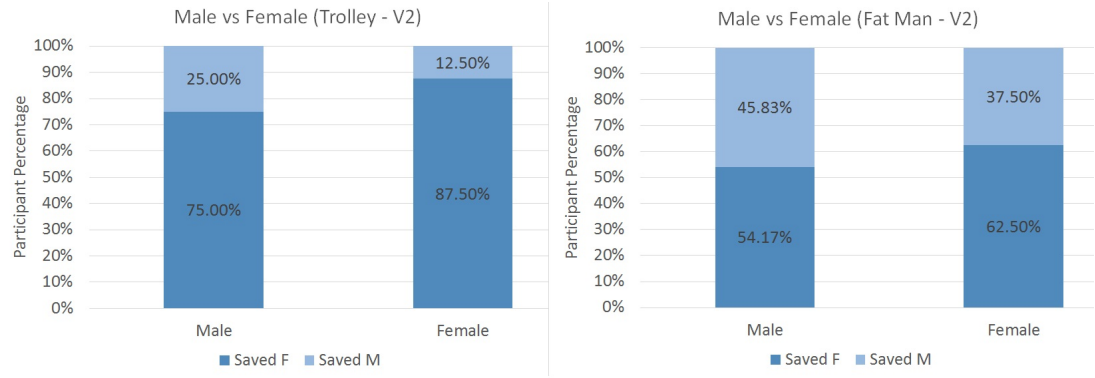
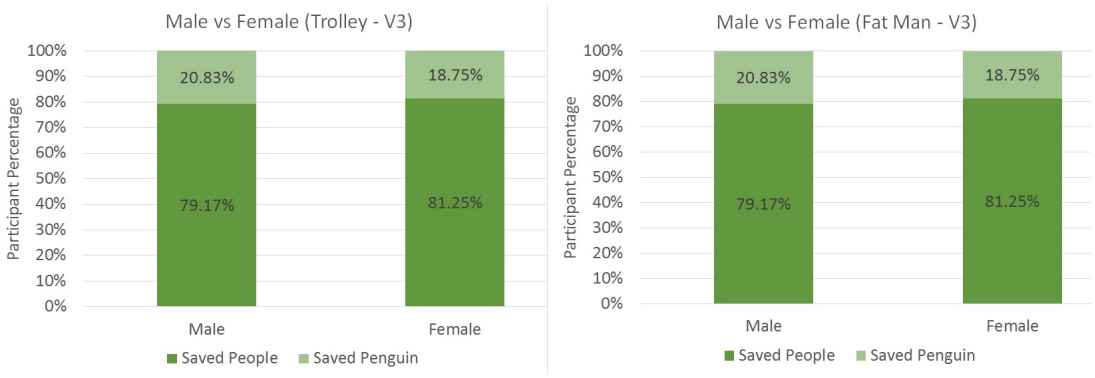


Figure 5.4: Gender comparison of results for the Fat Man Problem in V2.



When comparing the results between males and females there are few differences in the outcomes across most scenarios, the main differences found were that female participants were more likely to save the individual and the female characters in the ‘‘Fat Man” problem, compared to the male participants. These results did not prove significant, but are worth noting. For the “Trolley Problem” the choices for all scenarios were found to be significant, but for the “Fat Man Problem” only 2 of the 6 scenarios had choices which proved significant. This suggests that females are more likely to consider the life of the individual on the bridge, showing more moral deliberation in their choice between saving the majority and the action involved in saving them. These results also suggests that females have

Figure 5.5: Gender comparison of results for the Fat Man Problem in V3.



a higher preference towards saving the females than the males do, particularly in the "Fat Man" problem.

To explore this idea further, the results from the 'Fat Man Problem" in V2 were analysed to determine the split between whether the differently gendered characters were saved when on the bridge or when on the track. As seen in Figure 5.4, of the male participants 54.17% (n = 13) saved the female character(s), and the remaining 45.83% (n = 11) saved the male character(s). For the female participants, 62.5% (n = 10) saved the female character(s) and the remaining 37.5% (n = 6) saved the male character(s). Each of these portions were analysed individually to determine whether there were any preferences to involving or omitting their self from the dilemma, this would give a better indication of the gender preferences.

Of the 13 male participants who saved the female character(s), 69.23% (n = 9) of them saved the females when on the track and the remaining 30.77% (n = 4) saved the female character on the bridge with them.

For the 11 other male participants, 54.55% (n = 6) of them saved the male characters when on the track and the remaining 45.45% (n = 5) saved the male character on the bridge with them.

Of the 10 female participants who saved the female character(s), 30% (n = 3) of them saved the female character when on the track and the remaining 70% (n = 7) saved the female character on the bridge with them.

Table 5.2: Confidence Intervals of Proportion from each gender of participant

Variation	Problem	Character Saved	Male	Female
V1	Trolley	5	0.875	0.875
		1	0.125	0.125
	Fat Man	5	0.75	0.3125
		1	0.25	0.6875
V2	Trolley	F	0.75	0.875
		M	0.25	0.125
	Fat Man	F	0.542	0.625
		M	0.458	0.375
V3	Trolley	Human	0.792	0.8125
		Non-Human	0.208	0.1875
	Fat Man	Human	0.792	0.8125
		Non-Human	0.208	0.1875

For the 6 other female participants, 16.67% (n = 1) of them saved the male characters when on the track and the remaining 83.33% (n = 5) saved the male character on the bridge with them.

This split in the results shows us that even when the gender of the character is alternating, the female participants appear to prioritise the life of the character on the bridge with them, despite the gender of the character. This is reinforced by the strong preference found in female participants for saving the 1 in V1 of the "Fat Man Problem". These results also show that male participants are more comfortable saving the life of the females on the track by sacrificing a males life, rather than saving the life of males on the track by sacrificing a females life. This could be related to some "evolutionary reasoning" as participants mentioned which will be discussed later in chapter 5.6. Overall, females appear more concerned with preserving the life of the individual on the bridge than sacrificing the lives of the individuals on the track which could potentially be related back to the idea of care ethics [34], where women are the preferred characters to save which has been previously found in other work [108].

The results have been visualised in Figures 5.3, 5.4, and 5.5, and the confidence intervals for each gender can be seen in Table 5.2

5.4 Moral Foundation Questionnaire

The MFQ results were analysed to determine which of the foundations were prominent in participants. They were compared to the outcomes to determine whether there was any distinct pattern between the moral foundations and preferences shown through participant decisions.

Calculating the mean found that the "Fairness/Reciprocity" and the "Harm/Care" are the most commonly high scored and prominent foundations (μ=21.35, μ=21.18 respectively) that participants value in their own morality. It was also found that "Purity/Sanctity" is one of the least commonly valued foundations (μ=11.40). The standard deviation shows a smaller spread (σ= 4.07 - 4.53) for the foundations with a higher mean than foundations with a lower mean (σ= 5.24). Further, foundations with a higher median such as "Harm/Care" and "Fairness/Reciprocity" show that they are two of the frequently higher rated foundations compared to the other foundations. This is also shown through the modes with a distinct order in the most common scores for each foundation.

Table 5.3: Statistical analysis of MFQ results.

Moral Foundation	Arithmetic Mean	SD (σ)	Median	Mode
Harm/Care	21.18	4.53	23	23
Fairness/Reciprocity	21.35	4.07	20	17
In-group/Loyalty	15.53	5.13	15.5	17
Authority/Respect	15.75	5.0	15	11
Purity/Sanctity	11.40	5.24	11	7

This was done to give an insight to which foundations were the most prominent in the participants for this study, they can be seen in Table 5.3. On average it can be seen that Harm/Care and Fairness/Reciprocity have the highest averages, each of these foundations will be used to further explore any patterns with behaviours in the dilemmas.

The moral foundations of participants were compared to their outcomes to try determine any patterns or trends with how participants made their moral decisions.

Table 5.4: MFQ averages of groups that displayed a preference.

Moral Foundation	Save 5	Save 1	Female	Male	Human	Non-Human
Harm/Care	21.1	14.5	20.05	22.83	21.87	20
Fairness/Reciprocity	20.5	17	20.52	21.67	22.1	19.14
In-group/Loyalty	16.8	14.5	15.1	16.33	15	17.57
Authority/Respect	15.95	19	15.86	17.33	15.35	16.14
Purity/Sanctity	11.6	11.5	10.71	11.33	11.19	13.71

Firstly, to determine whether there were any patterns they were split into groups based on their outcomes. In V1 there is the "Save the 5" (n=20) and "Save the 1" (n=2), in V2 "Female preference" (n=21) and "Male preference"(n=6), and in V3 "Human preference" (n=31) and "Animal preference"(n=7), these were the groups of participants that displayed a clear preference to one of the two possibilities in the dilemmas (e.g. Saved the 5 in Trolley V1 and Fat Man V1). There were also a considerable amount of participants that didn't display a clear preference in their decisions (e.g. Saved the 5 in Trolley V1 and 1 in Fat Man) for V1 (n=18), V2 (n=13), and V3 (n=2). For each group, the average score for each moral foundation was calculated and compared against its group counterpart.

The averages for each group can be seen in Table 5.4. Comparisons can be made between the differences in the averages, for V1, you can see that those who displayed a preference to save the 5 on average scored considerably higher for the "Harm/Care" and the "Fairness/Reciprocity" foundations, where as those who displayed a preference to save the 1 on average scored higher on the "Authority/Respect" foundation. For V2 and V3 very little difference can be seen between the averages of the preference groups, indicating that their moral foundations may not designate a preference for V2 and V3.

However due to the significant difference in group sizes, this shows little significance when comparing the averages for each moral foundation. While the comparisons suggest very little, the size of each group is significant in itself due to the difference between participants who committed to their moral decisions. This suggests that, as previously discussed, the ideas of "Save the 5" (n=20), "Save the female" (n=21) and "Save the human" (n=31) are strong influences when presented with a moral dilemma.

5.5 Moral Competence Test

The official definition from the author Georg Lind states that the C-score *"reflects a participant's ability to rate arguments pro and contra a certain moral decision in regard to the arguments' moral quality instead of in regard to their opinion agreement or other criteria, or in short: their moral competence."*. The C-score can range between 0 and 100 (no moral competence to very high moral competence), and is defined that *"In general, a C-score between 0 and 9 can be interpreted as "very low" or "zero moral competence", between 10 and 29 is the "medium" range in which most (educated) people seem to be. All scores above 30 can be considered as "high moral competence"."* and is to be interpreted as the group average rather than individually. This is how a reliable, stable C-score is found, due to the nature of the MCTs development.

The standard administration for the MCT is stated in the documentation by the author, which involves two applications of the test. The first test was answered prior to being given a moral task, and a follow-up identical test was given after the moral task. For the first test the C-scores were calculated and an average of medium moral competence was found (C = 16.4), while the median C-score was found to be slightly lower (C = 12.7). This indicates that there are a large number of C-scores from participants that are below the average, or the higher C-scores found potentially increase the average. The standard deviation indicates a sizeable spread across the data (σ= 11.18) and the interquartile range also shows a similar spread of the central 50% of the data (IQR = 11.33). The highest and lowest C-scores of individuals were also noted (C = 43.9, C = 1.5 respectively), the highest C-score indicates an incredibly high moral competence whereas the lowest C-score indicates basically no moral competence, this shows a wide range between the C-scores of the participants in this study.

For the second half of the MCT, a similar average of medium moral competence was found (C = 16.7) and again a slightly lower median was found (C = 13.4). This indicates, again, that there could be a large number of C-scores from participants that are below the average, or the those who scored a higher C-score potentially

Table 5.5: MCT Results Analysis

C-score	**Mean**	**Median**	**SD**	**IQR**	**Highest**	**Lowest**
Pre-VR	16.4	12.7	11.18	11.33	43.9	1.5
Post-VR	16.7	13.4	11.04	16.63	45	2.2

Table 5.6: C-score averages for the preference groups.

Average C-score	**Save 5**	**Save 1**	**Female**	**Male**	**Human**	**Non-Human**
Pre VR	12.63	13.10	15.40	21.15	15.43	23.33
Post VR	13.87	9.60	14.25	24.18	15.98	23.09

increased the average. The standard deviation is also of a similar spread to the first half of the MCT (σ= 11.04) while the interquartile range is slightly larger (IQR = 16.63). The highest and lowest C-scores (C = 45, C = 2.2 respectively) are also fairly similar to the first half of the MCT, the main difference between the two halves of the MCT results being a larger interquartile range meaning there is a larger spread across the central 50% of the data. This analysis of the MCT results can be seen in Table 5.5.

Overall the MCT results indicate a consistent mean of medium moral competence across participants, which could be due to the fairly limited demographics of participants used in this study. However they show a sizeable range of C-scores in the deviation and IQR, so there is some variation amongst participants despite being from similar demographics.

When exploring any potential relationships between C-scores and outcomes, the previously mentioned preference groups from the MFQ section were used to compare the average C-scores across each group. You can see the comparisons in Table 5.6, across pre and post VR C-scores, little difference can be seen in the means. When comparing the means only one of the comparisons proved to have a significant difference, which was the comparison between those with a clear male or female preference, in the second half of the MCT. The p-values can be seen in Table 5.7. This suggests that the difference between those with a clear female preference are likely to have a lower C-score compared to those with a male preference after experiencing a moral dilemma.

Table 5.7: MCT P-values for C-score comparisons.

P-Values	**Save 5**	**Save 1**	**Female**	**Male**	**Human**	**Non-Human**
Pre-VR	0.9442		0.986		0.989	
Post-VR	0.5484		0.0460		0.1281	

Table 5.8: MCT C-Score and MFQ result correlations

Moral Foundation	**Pre-VR C-Score**		**Post-VR C-Score**	
	Correlation	**P-Value**	**Correlation**	**P-Value**
Harm/Care	0.06	0.713	-0.01	0.951
Fairness/Reciprocity	0.01	0.951	-0.09	0.581
In-group/Loyalty	0.10	0.539	0.12	0.461
Authority/Respect	0.06	0.713	0.09	0.581
Purity/Sanctity	0.19	0.240	0.23	0.153

The MCT C-scores were also analysed alongside the moral foundations to explore if any patterns could be found. One of Linds [63] observations claims that people who are more religious often produce a generally lower C-score. Using this observation alongside the moral foundations would assume that those with a low C-score would have scored higher in the "Purity/Sanctity" foundation. To explore this, as well as any other possible patterns, participants C-scores were compared to each foundation and plotted to determine if there was any correlation between the variables. There were no significant correlations found for any of the moral foundations with the C-scores, ranging from -0.09 to 0.23. These coefficients show no correlation between the MCT C-scores and MFQ results, and none of them proved significant ($p<0.05$), this can be seen in Table 5.8.

5.6 Other Comments

Alongside all of the results that were collated and analysed, any comments or behaviours relating to their decision making processes and interpretations of the situation were noted during the participants time in the VR dilemmas. There was one clear split between participant behaviours. There were those who actively involved their self to help them rationalise and make their decisions as if the dilemmas were real (n = 17), and there were those who saw the dilemmas as a game/VR experience where their comments and behaviours indicated that they were morally disengaged or otherwise gamifying the experience (n = 10). The

other participants appeared to use a combination of these behaviours during the dilemmas (n = 13). The comments show this was due to the realisation they are only in VR and can experiment with different areas of the dilemmas.

Participants who seemed morally disengaged displayed several common behaviours such as laughing, explaining how they are *"killing everyone"* and *"leaving it (the outcome) to chance"* by throwing the lever back and forth. Some participants even comparing their situations to TV and film as participants stated *"I enjoy being the Hulk, I push them and they go flying."*, and *"Goodbye Pingu!"*. After they had completed the dilemmas, participants commented on how they thought the dilemmas were gamified, which they used to justify their actions, despite there being no game design elements implemented. This reasoning is reflective of Croft [94] findings. This is likely due to the realisation they are using VR and the prior knowledge that there are no real consequences from the dilemmas.

As for participants who seemed to be engaging with the dilemmas, many participants vocally justified their decision to intervene or not by referencing how they are *"not getting involved to avoid any responsibility"*, and how *"involving myself would make it my responsibility"*. Some also attempted to justify their preferences for females in certain scenarios, saying how *"women provide life"*, and how *"society needs women to repopulate"* basing their decisions on what appeared to be an evolutionary reasoning. One participant also referred to the *"The "Old traditions" of saving women and children first."* when justifying their decisions. Participants also referenced how *"penguins aren't endangered"* and *"emotional and intelligent people are more valuable to society."*. Common behaviours for this group included not watching the outcome of the dilemma, discussing how both outcomes are horrible, and that they are *"morally conflicted"*. Some participants even explained how they were *"confused at why I did that."* or ‘*"I didn't expect myself to do that."*, surprising themselves through their moral decisions when in the moment, suggesting that they believed they would have acted differently if the dilemmas were hypothetical. This kind of "gut decision making" is an example of the difference between moral decision making in practical and hypothetical dilemmas, this also reflects Joeckels [87] findings.

Some participants also displayed some pre-determined morality for the VR dilemmas. Participants discussed how the moral decision making was *"quite easy"*, they made instant decisions on who to save through the dilemma explanation while showing little distress or deliberation, and some even asked if they should do *"What I would do or what I should do? I should push them off for the greater good, but I wouldn't because I'm too scared."*.

This split was hypothesised during the design of the experiment, with a potential reason being the participants prior exposure to VR. This is why the participants were asked to rate their prior experience with VR from 1 (None at all) to 5 (Very Experienced). To test this hypothesis, the VR scores of each group were analysed to determine if there was any significant difference between groups. The averages of each group were extremely similar ($\mu = 2.588$, $\mu = 2.6$ respectively), with both the median and the most common score being the same (median/mode = 3). Comparing the means found that there was no significant difference ($p<0.05$) with a p-value of 0.9829. This suggests that prior experience in VR is not indicative of how a participant will interpret and behave in VR moral dilemmas.

Chapter 6

Conclusion

The research question of this work asks whether immersion in a virtual world impacts an individuals moral decision making, and if so, how? The term "virtual world" used here refers to video games and virtual reality. This work has found the effects of immersion on moral decision making to differ, depending on several aspects which will be discussed throughout this chapter.

6.1 Moral Decision Making in Video Games

To explore moral decision making in video games, two web surveys were designed using the MIT Moral Machine [13] as an influence. The surveys contained a series of moral dilemmas, as well as two Moral Foundation Questionnaires (MFQ) [146], one MFQ focused on the participants moral foundations in the real world, while the other focused on their moral foundations when playing video games. Each moral dilemma was designed based on a hypothetical scenario in either the real world or in a video game. Each contained two possible outcomes, where the participant would choose their favoured outcome. These dilemmas can be found in Appendix A. The surveys contained different structures and focuses.

The personal survey uses the participant as the subject throughout and focuses on what they would do in these moral dilemmas. The survey would be split into two sections, one section for the real world moral dilemmas and MFQ, and one section for the video game dilemmas and MFQ. The survey would randomise which section would be shown first, to avoid order bias affecting the results.

The aim of this survey was to investigate whether there were any differences between a participants moral foundations and decision making when presented with dilemmas based in real life and in video games.

The character survey asks the participant to name and describe one of their online video game characters before starting the survey, this character is then used as the subject in the moral dilemmas, where participants are asked to answer the moral dilemmas as they believe their characters would. This survey asked about their characters moral foundations and tailored all dilemmas to a video game situation as the participants character is the subject and real world dilemmas would not be suitable for a video game character. They were also asked about their own personal moral foundations after completing the dilemmas.

The aim of this survey was to explore if there were any differences between the moral decision making and foundations of the participant and their character, and how role-playing as their character could have affected their decisions.

Throughout the creation of this survey, the biggest issue came from designing the dilemmas. The dilemmas needed to be considered carefully, as they needed to be morally conflicting, applicable for a real world and/or video game scenario, and the context of the situation needed to be non-bias. Based on the research into moral dilemmas in video games, existing moral dilemma research and hypothetical moral dilemmas from media, these dilemmas were designed for the surveys with a variety of contexts and appropriate moral conflict. The potential ethical concerns through these dilemmas were also considered throughout design. The final dilemmas used in the web survey met these criteria and were appropriate for the purpose of the web survey. The results suggest that these dilemmas were useful in their purpose for both the personal and the character survey, where the context, understanding and moral conflict were all clear to the participant. The main limitations of the video game moral dilemmas were that their design is generalised to video games and may not be completely identifiable with the participants character and video game. This could be considered in further work by using environments that can incorporate participants characters to recreate more likely dilemmas their character would encounter, or observe the participants playing as their characters.

The results found few differences between surveys as the preferences shown were very similar across each. In a significant majority of cases, a choice to save the majority was made in each survey, slightly more females were saved than males, when evenly matched female and male choices were analysed, there were no significant preferences found due to the sample size, and saving “Friends” and ”NPCs” were the preferred option over “Strangers” where applicable. In another significant finding, children were favoured to be saved across both surveys, and after looking at the sample of evenly weighted choices of children vs adults, no significant preferences could be determined due to the small sample size. These findings and their consistency across both surveys suggests there is little difference when answering hypothetical moral dilemmas either as their self or as their video game character.

The surveys also considered whether the moral foundations would differ between surveys, as well as between the real world and video games. No significant results or differences were found when comparing the averages of each moral foundation across surveys, which suggests little difference in an individuals moral foundations when playing video games compared to in the real world. This also suggests that individuals do not differ their moral foundations between their self and their characters, despite the varied personalities and alignments of their characters.

To investigate whether the gender of the participant affected their moral decision making, the results were split into gender-based groups and compared to explore any preference to saving the majority or the minority of characters. A significant amount of male and female participants favoured saving the majority in both surveys. This suggests that there are no significant differences between genders for their preference of saving the majority in hypothetical moral dilemmas.

These results were also compared to explore whether there were any significant gender preferences in their choices from each gendered participant. The dilemmas which used an **even** amount of male and female characters in each choice were used to remove any chance of utilitarian reasoning to argue their choices, this resulted in a smaller amount of dilemmas used for the analysis. No results were found to be significant which suggests there is little difference in gender preference

for moral decision making in hypothetical moral dilemmas between the gender of the participants.

These results were also used to explore any preference towards saving children between each gendered participant. The dilemmas which used an **even** amount of adults and children in either choice were used to remove any chance of utilitarian reasoning to argue their choices, this resulted in a smaller sample size of dilemmas for the analysis. As such no significant results were found involving preference towards saving children over adults between gender of the participants.

The video game survey mainly focused on how an individuals immersion as a video game character can affect their moral decision making. The results for this survey categorised those who described their characters with clear alignments or moral standings into one of two groups: "Good" and "Bad" characters. Of all 32 characters, 11 were considered as "Good" and 8 considered as "Bad". These alignments were then analysed with their results to explore whether there were any significant differences between how these characters made their moral decisions throughout the survey.

Firstly, their preferences to save the majority or the minority were considered. The results found no significant differences between the "Good" and "Bad" characters in terms of choices made, as both groups significantly preferred to save the majority when available. This suggests that the way the individual makes moral decisions is not affected by the alignment of their video game characters.

The character alignments were also compared with the MFQ results to explore any differences between their moral foundations. When comparing "Good" and "Bad" characters, there were no significant differences found between the most prominent and the averages of each the character's and participant's MFQ foundations. This suggests that the alignment of their character has no effect on their moral foundations when answering hypothetical moral dilemmas. The video game focused MFQs were also compared to their personal MFQs, and there were very few differences found between these. This further suggests that immersion as their characters are unlikely to affect their morality and moral decision making.

6.2 Moral Decision Making in VR

To explore moral decision making in virtual reality, a simulation was designed using VR which replicates two well known moral dilemmas, the "Trolley Problem" and the "Fat Man Problem" [12]. Before completing the moral dilemmas, participants were asked to complete a Moral Foundations Questionnaire (MFQ) and the first half of the Moral Competence Test (MCT) [63] to understand their moral foundations and competence. They were given the second half of the MCT after completing the moral dilemmas per the authors instruction. Participants were then given a test run through each of these simulations, so they could familiarise their self with the controls. This involved switching a track that the trolley would travel down, and pushing a box from a bridge. They would then begin the VR moral dilemmas.

This simulation contains three different variations for each moral dilemma, these variations are V1 (Original - 1 person vs 5 people), V2 (Gender- Male vs Female) and V3 (Animal - Humans vs non-Humans). In each variation, the characters and their positions were randomly selected within the boundaries of the variation. Participants would be given one of the three conditions to start with, and then cycle through the next two variations. The participants decisions as well as their related behaviours and comments were noted down throughout the study.

The aim of this study was to investigate the effect of immersion in virtual reality on an individuals moral decision making.

Throughout the design of this study, the main concern was finding the balance between a simulation which was too realistic or too gamified. The "Trolley Problem" and "Fat Man Problem" were decided on as they have been previously used in VR research investigating moral decision making [128], [129], [131], [148]. The dilemmas needed to be fairly realistic to avoid any possible gamification or unwanted comedic effect, however not so realistic that participants would potentially become distressed or traumatised by the simulation. This was particularly an issue with the "Fat Man Problem" as there is no person with enough

mass to stop a moving train. To solve this, the train was slightly remodelled and re-sized. Overall, the final result found a suitable balance of the two, where the realism was appropriate but not distressing and there was minimal gamification of the moral dilemmas. Though this did not stop some participants treating it as a game.

The results found that the most significant factor for moral decision making in VR proved to be the characters used in the dilemma. For the "Trolley Problem" there were clear significant preferences displayed in each variation by each participant, which were saving the 5, saving the female and saving the humans. In the "Fat Man Problem" the preferences for saving the 5 and the female were found to be insignificant, whereas the preference for saving humans remained significant. Also, the level of involvement in each dilemma did not have any significant differences on the participants moral decision making, but the involvement must have been considered for those who made split choices in the characters they saved.

Gender differences were also considered to explore if they had any impact on moral decision making. In the "Trolley Problem" there was little difference found between the genders' decisions, both displaying significant preferences for saving the 5, the females and the humans in each variation. However, in the "Fat Man Problem" female participants showed a strong preference for saving the 1 as well as female characters, where the male participants showed a strong preference towards saving the 5. This is supported by the breakdown of the "Fat Man Problem" in V2 (Male vs Female) where the majority of characters saved by female participants were saved when on the bridge, despite the gender of the character, it was also found that male participants had a preference for saving the life of females on the track by pushing a male character from the bridge, this preference towards saving females has previously been found and supports this finding [108]. Overall the results show that female participants have a slightly stronger preference towards saving female characters, as well as saving the individual character on the bridge. This suggests that female participants prefer to avoid involving their self in moral dilemmas that have an increased level of involvement, which could be related back to the ideals of care ethics [34].

Participants were also asked to answer a Moral Foundation Questionnaire (MFQ) and Moral Competence Test (MCT), the results would then be compared to their choices to explore any possible patterns. The MFQ results found the most valued foundations to be Harm/Care and Fairness/Reciprocity. They also show no significant impact on an individuals decision making when compared between groups which displayed a clear preference in the dilemmas. The MCT results found a wide range of C-scores, but C-scores are to be analysed as a group rather than individually, as per the authors' instructions [63], so the averages were compared within the participants with clear preferences in the dilemmas. The results found only one significant difference in C-scores within the groups, which was the difference between those with a male and female preference. A correlation between the MFQ and MCT results was also calculated to explore if any patterns between the two were present, but no significant correlation was found between any moral foundation and C-scores.

The notable behaviours and comments which were recorded also allowed insights into each participants approach towards the dilemmas in VR. There was a clear split between those who morally disengaged from the dilemmas, with the realisation that there were no consequences for their actions, and those who morally engaged with the dilemmas, behaving as though their actions did have consequences. One hypothesis considered was that participants prior exposure to VR would have been an indicator of how someone may approach these dilemmas. However, no significant results were found and prior experience in VR did not seem to indicate how they would behave.

6.3 Insights - Utilitarian vs Deontology

Throughout this work, the insights stated in Chapter 2.3 were considered and observed within the studies. One common insight from previous work details that most moral decisions are made from either a utilitarian or a deontological perspective. For context, the utilitarian approach concerns the the consequences of a dilemma, whereas the deontological approach concerns the duties of the

individual making the decision, despite the outcome of the dilemma. One of the main concerns with this idea is that when you compare hypothetical and practical moral dilemmas, there is a considerable difference between what individuals claim they would do and what their actual response is. Previous studies [130], [131] have found this and claimed this is due to the reality and involvement of the moral dilemmas, as well as considerations of social desirability. This work considered any differences between hypothetical (Study one) and practical (Study two) moral dilemmas, as well as other factors that may affect this such as the "doing/allowing harm" distinction [37].

Both studies in this work considered these factors through their design and procedure, and the findings show little difference between the hypothetical dilemmas from the first study as the most popular options seemed to concern saving the majority of people where applicable. This is likely due to the hypothetical dilemmas often appearing as a numbers game, as there are no real consequences. In the second study similar results were also found in the 1-5 condition or V1 (1 vs 5) of the "Trolley Problem", as most participants chose to save the 5. As the second study used a more immersive environment which some found more engaging, this reaffirms the findings from the first study where participants may have considered it a simple numbers game. Although, there were still participants of the second study who found the simulation as more of a video game environment, which still could suggest the idea of there being a "lack of consequences" and it being "just a game" [94].The differences found were in the second studies different dilemmas and conditions as the percentage of participants that chose the option to save the 5 in V1 of the "Fat Man Problem" dropped considerably, this suggests that the concern may not be between the hypothetical and the practical, but from the level of involvement required from the individual in the dilemma, especially in practical dilemmas. This relates back to the "doing/allowing harm" distinction [37]. The act of pushing an individual from a bridge would be seen as directly doing harm to the 1 even though attempting to save the 5, whereas the act of pulling a lever to save the 5, which arguably is still doing harm to the 1, is more indirect about harming the 1 and instead the idea of saving the 5 becomes more favourable as there is less personal involvement as in the act of pushing. Therefore this study found that a dilemma which requires more personal interaction or direct form of

involvement is more likely to be solved through a deontological approach, possibly in an attempt to avoid any emotional involvement, personal involvement or guilt.

6.3.1 Effects of Gender

To further explore factors which affect moral decision making, the differences between participant gender were also considered. For the first study there were little differences found between genders and their preferences to save the majority or minority. As previous work suggested, a significant majority of participants selected the option to save the majority throughout the hypothetical dilemmas despite the participant gender. In the second study it was found that for the "Trolley problem", the same significant proportion of male and female participants opted for the option to save the 5, however in the "Fat Man problem" there were a larger proportion of male participants who opted for the option to save the 5, whereas female participants chose to save the 5 considerably less often. This suggests that the female participants were more considerate of the individual on the bridge with them, less likely to push them and directly involve their self in the dilemma due to the potential emotional/physical responses and guilt it may have caused them. As well as a potential deontological approach towards the dilemma, this could be related back to the ideals known as the ethics of care [34], the modern branch of virtue ethics which is not considered within deontological or consequentialist theories. Care ethics discusses "care" as *"maintaining the world of, and meeting the needs of, our self and others. It builds on the motivation to care for those who are dependent and vulnerable, and it is inspired by both memories of being cared for and the idealizations of self."* [151] where the individual on the bridge could be seen as vulnerable.

Overall these findings suggest that from a deontological/consequentialist viewpoint, there are few differences found between gender, where one difference found is that the female participants are more likely to refuse involvement in a practical dilemma which has more personal/physical interaction to save the majority.

6.3.2 Effects of Involvement

To explore if there was any significance in an individual involving or omitting their self from the practical dilemmas, the participant actions from the second study were recorded and analysed. From all 120 instances of the "Trolley Problem" participants chose to involve their self (pull the lever) just over half of the time, whereas in the "Fat Man Problem" they chose to involve their self slightly less, but still just over half of the time.

Neither of these results proved to be significant indicating that overall their involvement was not a large consideration for participants in their moral decision making, which is interesting based on the particular reactions of some participants, these findings suggests a potentially even sided split for both attitudes towards the dilemma which is discussed in 6.4.2. This could also have been due to the realisation that their actions in VR has no serious consequences in the real world, or the random selection of sides for characters affecting the results.

Overall the most important factor from the results around a participants moral decision making appeared to be the characters used as they had the most significant distinction in results across each variation and dilemma.

6.4 Insights - Moral Investment vs Moral Disengagement

Another common reporting in this field are the differing approaches which individuals take when presented with different situations in a virtual world. The two approaches considered here are those who invest their self into the game, and those who separate entirely from their actions in the virtual world. This is further explored through their avatars appearance, the "Proteus effect" and the design of their avatars.

As previous research has found, those who invest their self are likely to experience emotions such as stress and guilt when committing immoral actions in video games [88]–[92]. There were several factors mentioned that could have affected the level of investment, such as prior experience playing games, game realism, and length playing, among others. This suggests that those who invest in these virtual worlds, despite there being no real world consequences, would be likely to reflect their personal moral frameworks when presented with a moral dilemma in a virtual world. As well as experiencing negative emotions, individuals often value their relationships and pro-social behaviour through video games as much, sometimes more, than in the real world [99], [101]–[105]. It is also likely that these individuals design their avatars based on their self and then enhance their features of their real world self as found in Messingers work [110]. This allows them to behave as they would in the real world through their avatars, which potentially means they'd behave with a morality similar to their own.

On the contrary, those who separate from their virtual worlds realise that their actions have no consequences in the real world, thus not experiencing stress or guilt and could engage in immoral game-play. Previous research has claimed this approach is a result of "Moral Disengagement"[93] which affects player behaviour within video games and has also been explored in relation to real world immoral behaviour [95]–[98]. "Moral Disengagement" is where an individual becomes morally detached and believes that known ethical standards don't apply to them, where their actions have no consequence in the real world, such as in video games. Examples of this in previous research have found this to affect levels of guilt and negative emotion in video games [93], in real life [95]–[98], and examples include those who have been found to explain their moral reasoning in games to be because "It's just a game" [94].

These individuals could also experience the "Proteus Effect" [109], where a players behaviour is altered by the characteristics of their avatar. Arguments can be made for both sides. For those who morally engage with video games, they could design their avatars as enhanced versions of their self, and as such, the "Proteus Effect" could cause them to enhance their own behaviours through their avatars. As for those who become morally disengaged, when an individual adopts

their avatars persona, this could lead to de-individuation and they absorb their avatars perceived behaviours. This could potentially lead to immoral actions and behaviours through their characters.

This was considered through both studies. The first study focuses on how individuals behave through their avatars and how this compares to their self, where the second study focuses on how individuals behave in a realistic virtual world and whether they morally engage or disengage.

6.4.1 Proteus Effect and Perceived Personas

One theory from previous research is known as the "Proteus Effect" [109], where an individuals behaviour is affected by their characters appearance and perceived persona. This was considered for the first study and any differences in moral decision making could be partly due to the "Proteus Effect". However, the results from the first study found that there were no significant differences between the moral choices made in each survey between an individual and their characters. The results focused on the characters from the video game survey also found no significant differences. The significant choices made by either a "Good" or "Bad" character proved to be based on similar morality, preferring to save the majority and having similar moral foundations. This suggests that an individuals character and their perceived alignments does not affect their moral decision making in hypothetical moral dilemmas. Perhaps if more immersive environments were used that could incorporate their own video game characters, or if their behaviour were to be observed in their characters video game then this may produce interesting results.

6.4.2 Morally Conflicted or "Hulk Smash"?

The second study found a split between participant attitudes towards the dilemmas, and one theory of why there is this split in attitudes is due to the individuals prior experience in these virtual worlds. There were participants who exhibited

behaviours as though there were consequences to their choices in the dilemmas, indicated by their reactions, the struggle to decide and watch, wanting to "avoid responsibility", and justifications spoken aloud. Some participants even claiming they felt "morally conflicted" and that they were "confused as to why they did that". This group of participants clearly lean towards the morally engaged attitude, where their moral decision making in VR reflects their personal moral decision making processes, this has been seen in previous work [1], [88]–[92]. On the other hand, there were participants who were laughing as the dilemmas were carried out, discussing how they want to "kill everyone" and "leave it to chance". One participant even compared their self to the Hulk, claiming they loved "pushing people so they go flying (off the bridge)". These participants also made comments on how they felt the dilemmas were gamified, in an attempt to justify their choices, similar to Crofts' [94] work. This group of participants clearly lean towards the morally disengaged attitude, where the immersion in VR has affected their moral decision making, this has also been found in previous work [93], [95]–[98]. There were also participants who showed a mixture of these behaviours. To investigate the theory of these split attitudes, participants were asked to rate their prior experience in VR. There were no significant difference in terms of prior experience overall between the two groups of participants, suggesting that prior experience in VR is not indicative of how an individual will approach moral dilemmas in VR.

6.5 Summary

Throughout this work, the main aim was to explore whether immersion in a virtual world impacted an individuals moral decision making. The findings of this work demonstrate that it is possible for immersion to affect moral decision making, however, to what extent differs from person to person.

In hypothetical dilemmas, this work has found an individuals video game character to have no significant effect on their moral decision making. The results found similar moral decision making processes between real world and video game scenarios, as well as similarities between an individuals morality and their

characters. From this study, it was found that the immersion of a character did not affect the individuals moral decision making in hypothetical moral dilemmas.

In practical dilemmas, this work found that being immersed in virtual reality can affect an individuals moral decision making. For the individuals that become aware that they are in a virtual world where there are no consequences for their actions, they begin to treat the dilemmas as a game. It was also found that there are individuals whose moral decision making processes were reflected in virtual reality. This was indicated by their deliberation, voiced concerns, and struggles when trying to make a choice, as if there were real world consequences to their decision.

There are many possible applications for work within this area of research, it informs about moral decision making and what processes are used. It also provides further understanding to behaviour in virtual worlds through social and philosophical considerations. As technology advances, the immersion in video games and virtual reality will only continue to improve. As such, future work will continue to explore the effect of immersion on moral decision making through these virtual worlds, and this will lead to further motivated and thought-provoking research.

References

[1] A. J. Weaver and N. Lewis, 'Mirrored morality: An exploration of moral choice in video games', *Cyberpsychology, Behavior, and Social Networking*, vol. 15, no. 11, pp. 610–614, 2012.

[2] L. Hudson, *If you didn't kill that zombie, maybe I won't either*, 2015. [Online]. Available: https://fivethirtyeight.com/features/if-you-didnt-kill-that-zombie-maybe-i-wont-either/.

[3] M. Sicart, 'Moral dilemmas in computer games', *Design Issues*, vol. 29, no. 3, pp. 28–37, 2013.

[4] J. Švelch, 'The good, the bad, and the player: The challenges to moral engagement in single-player avatar-based video games', in *Ethics and game design: Teaching values through play*, IGI Global, 2010, pp. 52–68.

[5] Z. Hussain and M. D. Griffiths, 'Gender swapping and socializing in cyberspace: An exploratory study', *CyberPsychology & Behavior*, vol. 11, no. 1, pp. 47–53, 2008.

[6] R. M. Martey, J. Stromer-Galley, J. Banks, J. Wu and M. Consalvo, 'The strategic female: Gender-switching and player behavior in online games', *Information, Communication & Society*, vol. 17, no. 3, pp. 286–300, 2014.

[7] Z. Villines, *The psychology of online role-playing games*, 2013. [Online]. Available: https://www.goodtherapy.org/blog/psychology-of-online-role-playing-games-0527138.

[8] P. Stromberg, *Are role-playing gamers insane?*, 2010. [Online]. Available: https://www.psychologytoday.com/gb/blog/sex-drugs-and-boredom/201003/are-role-playing-gamers-insane.

[9] S. de Ribaupierre, B. Kapralos, F. Haji, E. Stroulia, A. Dubrowski and R. Eagleson, 'Healthcare training enhancement through virtual reality and serious games', in *Virtual, Augmented Reality and Serious Games for Healthcare 1*, Springer, 2014, pp. 9–27.

[10] L. Freina and M. Ott, 'A literature review on immersive virtual reality in education: State of the art and perspectives', in *The International Scientific Conference eLearning and Software for Education*, " Carol I" National Defence University, vol. 1, 2015, p. 133.

[11] R. Lovreglio, V. Gonzalez, R. Amor, M. Spearpoint, J. Thomas, M. Trotter and R. Sacks, 'The need for enhancing earthquake evacuee safety by using virtual reality serious games', in *Lean & Computing in Construction Congress 2017*, 2017.

[12] P. Foot, 'The problem of abortion and the doctrine of double effect', 1967.

[13] M. I. of Technology, *Moral machine*, 2016. [Online]. Available: http://moralmachine.mit.edu.

[14] J. Prinz, *Subcortex*, 2017. [Online]. Available: http://subcortex.com/.

[15] NBC, *The Good Place*, [TV], 2017.
[16] Vsauce, *The greater good - mind field*, 2017. [Online]. Available: https://www.youtube.com/watch?v=1sl5KJ69qiA&t.
[17] T. Games, *The walking dead*, [online], 2012. [Online]. Available: http://store.steampowered.com/agecheck/app/207610/.
[18] A. Studios, *Prey*, [CD-ROM], 2017.
[19] L. Parker, *Black or white: Making moral choices in video games, why are moral choices in games so black and white?*, 2009. [Online]. Available: https://www.gamespot.com/articles/black-or-white-making-moral-choices-in-video-games/1100-6240211/.
[20] B. Perdue, *Ethical dilemmas and dominant moral strategies in games*, 2011. [Online]. Available: https://www.gamasutra.com/view/feature/6460/ethical_dilemmas_and_dominant_.php?print=1.
[21] N. Scibetta, *The runaway trolley: The ethical question that drives prey*, 2017. [Online]. Available: https://www.gamecrate.com/prey-runaway-trolley-ethics-story-ending/16214.
[22] M. Hocknull, *The use of virtual reality in teaching moral philosophy*, 2018. [Online]. Available: https://heri.blogs.lincoln.ac.uk/he-research-awards/the-use-of-virtual-reality-in-teaching-moral-philosophy/?fbclid=IwAR2aiBsW9qTUnJVqpnewasVSZJU_rwVrA6XixBUQrlUPTL5kMnhi2iKj2tU.
[23] S. E. of Philosophy, *Virtue ethics*, 2003. [Online]. Available: https://plato.stanford.edu/entries/ethics-virtue/#Virt.
[24] X. Yao, *An introduction to confucianism*. Cambridge University Press, 2000.
[25] K. L. Rich, *Introduction to ethics*. Nursing Ethics, 2013.
[26] I. E. of Philosophy, *Virtue ethics*, 1995. [Online]. Available: https://www.iep.utm.edu/virtue/.
[27] S. E. of Philosophy, *Aristotles' ethics*, 2001. [Online]. Available: https://plato.stanford.edu/entries/aristotle-ethics/.
[28] E. Fernandez, *Man knowledge: The greek philosophers*, 2010. [Online]. Available: https://www.artofmanliness.com/articles/man-knowledge-the-greek-philosophers/.
[29] G. E. M. Anscombe, 'Modern moral philosophy', *Philosophy*, vol. 33, no. 124, pp. 1–19, 1958.
[30] S. E. of Philosophy, *Gertrude elizabeth margaret anscombe*, 2009. [Online]. Available: https://plato.stanford.edu/entries/anscombe/.
[31] A. MacIntyre, *After virtue*. A&C Black, 2013.
[32] T. B. of Philosophy, *Eudaimonism*, 2008. [Online]. Available: https://www.philosophybasics.com/branch_eudaimonism.html.
[33] S. E. of Philosophy, *Agent-based and exemplarist virtue ethics*, 2003. [Online]. Available: https://plato.stanford.edu/entries/ethics-virtue/#AgenBaseExemVirtEthi.
[34] B. Burton and C. Dunn, *Ethics of care*, 2013. [Online]. Available: https://www.britannica.com/topic/ethics-of-care.
[35] S. E. of Philosophy, *Deontological ethics*, 2007. [Online]. Available: https://plato.stanford.edu/entries/ethics-deontological/.

[36] ——, *The history of utilitarianism*, 2009. [Online]. Available: https://plato.stanford.edu/entries/consequentialism/.
[37] ——, *Doing vs. allowing harm*, 2002. [Online]. Available: https://plato.stanford.edu/entries/doing-allowing/.
[38] R. Broeders, K. Van Den Bos, P. A. Müller and J. Ham, 'Should i save or should i not kill? how people solve moral dilemmas depends on which rule is most accessible', *Journal of Experimental Social Psychology*, vol. 47, no. 5, pp. 923–934, 2011.
[39] C. Shallow, R. Iliev and D. Medin, 'Trolley problems in context', *Judgment and Decision Making*, vol. 6, no. 7, p. 593, 2011.
[40] C. Chelini, A. Lanteri and S. Rizzello, 'Moral dilemmas and decision-making: An experimental trolley problem', *International Journal of Social Sciences*, vol. 4, no. 4, 2009.
[41] A. Lanteri, C. Chelini and S. Rizzello, 'An experimental investigation of emotions and reasoning in the trolley problem', *Journal of Business Ethics*, vol. 83, no. 4, pp. 789–804, 2008.
[42] D. M. Bartels, 'Principled moral sentiment and the flexibility of moral judgment and decision making', *Cognition*, vol. 108, no. 2, pp. 381–417, 2008.
[43] D. M. Bartels and D. L. Medin, 'Are morally motivated decision makers insensitive to the consequences of their choices?', *Psychological Science*, vol. 18, no. 1, pp. 24–28, 2007.
[44] D. M. Bartels and D. A. Pizarro, 'The mismeasure of morals: Antisocial personality traits predict utilitarian responses to moral dilemmas', *Cognition*, vol. 121, no. 1, pp. 154–161, 2011.
[45] M. Hauser, *Moral minds: How nature designed our universal sense of right and wrong*. Ecco/HarperCollins Publishers, 2006.
[46] L. Kohlberg, 'Stages of moral development', *Moral education*, vol. 1, no. 51, pp. 23–92, 1971.
[47] S. McLeod, 'Kohlberg's stages of moral development', 2013. [Online]. Available: https://www.simplypsychology.org/kohlberg.html.
[48] A. Colby and L. Kohlberg, 'The measurement of moral judgement: Vol. 1. theoretical foundations and research validation', *New York: Cambridge*, 1987.
[49] J. Haidt and J. Graham, 'When morality opposes justice: Conservatives have moral intuitions that liberals may not recognize', *Social Justice Research*, vol. 20, no. 1, pp. 98–116, 2007, ISSN: 1573-6725. DOI: 10.1007/s11211-007-0034-z. [Online]. Available: https://doi.org/10.1007/s11211-007-0034-z.
[50] J. Graham, B. A. Nosek, J. Haidt, R. Iyer, S. Koleva and P. H. Ditto, 'Mapping the moral domain.', *Journal of personality and social psychology*, vol. 101, no. 2, p. 366, 2011.
[51] C. Gilligan, *In a different voice*. Harvard University Press, 1993.
[52] R. A. Shweder, M. Mahapatra and J. G. Miller, 'Culture and moral development', *The emergence of morality in young children*, pp. 1–83, 1987.
[53] T. P. Kalam, 'The myth of stages and sequence in moral and religious development', PhD thesis, University of Lancaster, 1981.

[54] O. J. Flanagan and O. J. Flanagan, *Varieties of moral personality: Ethics and psychological realism*. Harvard University Press, 2009.
[55] T. Reed, *Developmental moral theory*, 1987.
[56] R. James, C. Douglas, C. Richard, M. JoAnna and A. Douglas, 'Judging the important issues in moral dilemmas: An objective measure of development.', *Developmental Psychology*, vol. 10, no. 4, p. 491, 1974.
[57] A. Schlaefli, J. R. Rest and S. J. Thoma, 'Does moral education improve moral judgment? a meta-analysis of intervention studies using the defining issues test', *Review of Educational Research*, vol. 55, no. 3, pp. 319–352, 1985.
[58] M. J. Bebeau, 'The defining issues test and the four component model: Contributions to professional education', *Journal of moral education*, vol. 31, no. 3, pp. 271–295, 2002.
[59] P. M. King and M. J. Mayhew, 'Moral judgement development in higher education: Insights from the defining issues test', *Journal of moral education*, vol. 31, no. 3, pp. 247–270, 2002.
[60] J. R. Rest, 'Longitudinal study of the defining issues test of moral judgment: A strategy for analyzing developmental change.', *Developmental Psychology*, vol. 11, no. 6, p. 738, 1975.
[61] D. R. Elm and J. Weber, 'Measuring moral judgment: The moral judgment interview or the defining issues test?', *Journal of Business Ethics*, vol. 13, no. 5, pp. 341–355, 1994.
[62] G. Lind, 'An introduction to the moral judgment test (mjt)', *Unpublished manuscript. Konstanz: University of Konstanz. http://www. uni-konstanz. de/ag-moral/pdf/MJT-introduction. PDF*, 1998.
[63] ——, *The moral competence test*, [online], 1976. [Online]. Available: `https://www.uni-konstanz.de/ag-moral/mut/mjt-engl.htm`.
[64] P Bataglia, M. Agati, S. Torres, D. Crivelaro, D. Oliveira and T. Quevedo, 'The development of moral competence and religious commitment in brazil', in *Meeting of the Association for Moral Education, Chicago*, 2002.
[65] M Schillinger-Agati and G Lind, 'Moral competence, role-taking and higher education: A cross-cultural pilot study', in *Th Annual Meeting of the Association for Moral Education, Vancouver, Canada*, 2001.
[66] G. Lind, *Studies on the measurement, nature and development of moral-democratic competence (mct)*, [online], 2017. [Online]. Available: `http://www.uni-konstanz.de/ag-moral/mut/mjt-references.htm`.
[67] J. Graham, J. Haidt, S. Koleva, M. Motyl, R. Iyer, S. P. Wojcik and P. H. Ditto, 'Moral foundations theory: The pragmatic validity of moral pluralism', in *Advances in experimental social psychology*, vol. 47, Elsevier, 2013, pp. 55–130.
[68] J. Haidt, J. Graham and C. Joseph, 'Above and below left–right: Ideological narratives and moral foundations', *Psychological Inquiry*, vol. 20, no. 2-3, pp. 110–119, 2009.
[69] K. A. Johnson, J. N. Hook, D. E. Davis, D. R. Van Tongeren, S. J. Sandage and S. A. Crabtree, 'Moral foundation priorities reflect us christians' individual differences in religiosity', *Personality and Individual Differences*, vol. 100, pp. 56–61, 2016.
[70] J. Graham, J. Haidt and B. A. Nosek, 'Liberals and conservatives rely on different sets of moral foundations.', *Journal of personality and social psychology*, vol. 96, no. 5, p. 1029, 2009.

[71] J. B. Hirsh, C. G. DeYoung, X. Xu and J. B. Peterson, 'Compassionate liberals and polite conservatives: Associations of agreeableness with political ideology and moral values', *Personality and Social Psychology Bulletin*, vol. 36, no. 5, pp. 655–664, 2010.
[72] A. Nilsson and A. Erlandsson, 'The moral foundations taxonomy: Structural validity and relation to political ideology in sweden', *Personality and Individual Differences*, vol. 76, pp. 28–32, 2015.
[73] O. Yilmaz, M. Harma, H. G. Bahçekapili and S. Cesur, 'Validation of the moral foundations questionnaire in turkey and its relation to cultural schemas of individualism and collectivism', *Personality and Individual Differences*, vol. 99, pp. 149–154, 2016.
[74] C. L. Davies, C. G. Sibley and J. H. Liu, 'Confirmatory factor analysis of the moral foundations questionnaire', *Social Psychology*, 2014.
[75] M. Sicart, 'The banality of simulated evil: Designing ethical gameplay', *Ethics and information technology*, vol. 11, no. 3, pp. 191–202, 2009.
[76] M. J. Nelson, *The morality systems of black and white and fable*, [online], 2006. [Online]. Available: `http://www.kmjn.org/notes/moral_systems_bw_fable.html`.
[77] C. J. Moore, 'Making moral choices in video games', *Virtual Lives*, 2011.
[78] J. P. Zagal, 'Ethically notable videogames: Moral dilemmas and gameplay.', in *DiGRA Conference*, 2009.
[79] M. J. Heron and P. H. Belford, 'Do you feel like a hero yet? externalized morality in video games.', 2014.
[80] P. E. Rauch, 'Playing with good and evil: Videogames and moral philosophy', PhD thesis, Massachusetts Institute of Technology, 2007.
[81] J. P. Zagal, 'Ethical reasoning and reflection as supported by single-player videogames', in *Designing games for ethics: Models, techniques and frameworks*, IGI Global, 2011, pp. 19–35.
[82] M. Sicart, 'Take the money and run? an ethical approach to the relation between game research and game industry', in *International Conference on Entertainment Computing*, Springer, 2004, pp. 163–167.
[83] M. Schulzke, 'Defending the morality of violent video games', *Ethics and Information Technology*, vol. 12, no. 2, pp. 127–138, 2010.
[84] J. Cogburn and M. Silcox, *Philosophy through video games*. Routledge, 2009.
[85] J. B. Funk, D. D. Buchman, J. Jenks and H. Bechtoldt, 'Playing violent video games, desensitization, and moral evaluation in children', *Journal of Applied Developmental Psychology*, vol. 24, no. 4, pp. 413–436, 2003.
[86] S. Hodge, J. Taylor, J. McAlaney and C. Gatzidis, 'Design of a videogame to explore morality', in *Proceedings of the 30th International BCS Human Computer Interaction Conference: Companion Volume*, BCS Learning & Development Ltd., 2016, p. 44.
[87] S. Joeckel, N. D. Bowman and L. Dogruel, 'Gut or game? the influence of moral intuitions on decisions in video games', *Media Psychology*, vol. 15, no. 4, pp. 460–485, 2012.
[88] M. Grizzard, R. Tamborini, R. J. Lewis, L. Wang and S. Prabhu, 'Being bad in a video game can make us morally sensitive', *Cyberpsychology, Behavior, and Social Networking*, vol. 17, no. 8, pp. 499–504, 2014.

[89] M. Gollwitzer and A. Melzer, 'Macbeth and the joystick: Evidence for moral cleansing after playing a violent video game', *Journal of Experimental Social Psychology*, vol. 48, no. 6, pp. 1356–1360, 2012.

[90] S. Hodge, J. Taylor and J. McAlaney, 'Moral development and video game play', in *Annual Conference 2017*, The British Psychological Society, 2017, pp. 48–49.

[91] X. Gao, L. Weng, Y. Zhou and H. Yu, 'The influence of empathy and morality of violent video game characters on gamers' aggression', *Frontiers in psychology*, vol. 8, p. 1863, 2017.

[92] J. H. Brockmyer, C. M. Fox, K. A. Curtiss, E. McBroom, K. M. Burkhart and J. N. Pidruzny, 'The development of the game engagement questionnaire: A measure of engagement in video game-playing', *Journal of Experimental Social Psychology*, vol. 45, no. 4, pp. 624–634, 2009.

[93] T. Hartmann and P. Vorderer, 'It's okay to shoot a character: Moral disengagement in violent video games', *Journal of Communication*, vol. 60, no. 1, pp. 94–119, 2010.

[94] J. Croft, ''it's just a game': Ethical reasoning within virtual worlds', *GoodWork Project Report Series*, no. 73, 2011.

[95] A. Gabbiadini, P. Riva, L. Andrighetto, C. Volpato and B. J. Bushman, 'Interactive effect of moral disengagement and violent video games on self-control, cheating, and aggression', *Social Psychological and Personality Science*, vol. 5, no. 4, pp. 451–458, 2014.

[96] T. Greitemeyer and N. McLatchie, 'Denying humanness to others: A newly discovered mechanism by which violent video games increase aggressive behavior', *Psychological science*, vol. 22, no. 5, pp. 659–665, 2011.

[97] C. Klimmt, H. Schmid, A. Nosper, T. Hartmann and P. Vorderer, 'How players manage moral concerns to make video game violence enjoyable', *Communications*, vol. 31, no. 3, pp. 309–328, 2006.

[98] T. Hartmann, K. M. Krakowiak and M. Tsay-Vogel, 'How violent video games communicate violence: A literature review and content analysis of moral disengagement factors', *Communication Monographs*, vol. 81, no. 3, pp. 310–332, 2014.

[99] H. Cole and M. D. Griffiths, 'Social interactions in massively multiplayer online role-playing gamers', *Cyberpsychology & behavior*, vol. 10, no. 4, pp. 575–583, 2007.

[100] N. D. Bowman, D. Schultheiss and C. Schumann, '"i'm attached, and i'm a good guy/gal!": How character attachment influences pro-and anti-social motivations to play massively multiplayer online role-playing games', *Cyberpsychology, Behavior, and Social Networking*, vol. 15, no. 3, pp. 169–174, 2012.

[101] E. University, *Eve university - eve's premier teaching organisation*, 2018. [Online]. Available: `https://www.eveuniversity.org/`.

[102] T. F. Rats, *The fuel rats - we have fuel. you don't*, [online], 2018. [Online]. Available: `https://fuelrats.com/`.

[103] /u/Armyof19, *Need an item delivered to you? join cc [deliveritems]!*, [online], 2016. [Online]. Available: `https://www.reddit.com/r/2007scape/comments/4jd20v/need_an_item_delivered_to_you_join_cc_deliveritems/`.

[104] /u/JazRR944, *[suggestion] can we compile a list of all the useful and interesting cc's in the sidebar?*, [online], 2018. [Online]. Available:

https://www.reddit.com/r/2007scape/comments/95addf/suggestion_can_we_compile_a_list_of_all_the/?st=jkldy34v&sh=7e9f973d.

[105] N. Yee, 'The demographics, motivations, and derived experiences of users of massively multi-user online graphical environments', *Presence: Teleoperators and virtual environments*, vol. 15, no. 3, pp. 309–329, 2006.

[106] N. Yee, J. N. Bailenson, M. Urbanek, F. Chang and D. Merget, 'The unbearable likeness of being digital: The persistence of nonverbal social norms in online virtual environments', *CyberPsychology & Behavior*, vol. 10, no. 1, pp. 115–121, 2007.

[107] Y. Ferstl, E. Kokkinara and R. Mcdonnell, 'Facial features of non-player creatures can influence moral decisions in video games', *ACM Transactions on Applied Perception (TAP)*, vol. 15, no. 1, p. 4, 2017.

[108] C. J. Headleand, J. Jackson, B. Williams, L. Priday, W. J. Teahan and L. Ap Cenydd, 'How the perceived identity of a npc companion influences player behavior', in *Transactions on Computational Science XXVIII*, Springer, 2016, pp. 88–107.

[109] N. Yee and J. Bailenson, 'The proteus effect: The effect of transformed self-representation on behavior', *Human communication research*, vol. 33, no. 3, pp. 271–290, 2007.

[110] P. R. Messinger, X. Ge, E. Stroulia, K. Lyons, K. Smirnov and M. Bone, 'On the relationship between my avatar and myself', *Journal For Virtual Worlds Research*, vol. 1, no. 2, 2008.

[111] D. Smahel, L. Blinka and O. Ledabyl, 'Playing mmorpgs: Connections between addiction and identifying with a character', *CyberPsychology & Behavior*, vol. 11, no. 6, pp. 715–718, 2008.

[112] GameSpot, *Reality check - what are we hiding? character creation psychology! (part.1) - reality check*, 2014. [Online]. Available: https://www.youtube.com/watch?v=brsfdLroDNA&feature=youtu.be&t.

[113] K. Bessière, A. F. Seay and S. Kiesler, 'The ideal elf: Identity exploration in world of warcraft', *Cyberpsychology & behavior*, vol. 10, no. 4, pp. 530–535, 2007.

[114] A. E. Park and T. B. Henley, 'Personality and fantasy game character preferences', *Imagination, cognition and personality*, vol. 27, no. 1, pp. 37–46, 2007.

[115] M. Companion and R. Sambrook, 'The influence of sex on character attribute preferences', *CyberPsychology & Behavior*, vol. 11, no. 6, pp. 673–674, 2008.

[116] M. L. Lewis, R. Weber and N. D. Bowman, '"they may be pixels, but they're my pixels:" developing a metric of character attachment in role-playing video games', *CyberPsychology & Behavior*, vol. 11, no. 4, pp. 515–518, 2008.

[117] M. D. Griffiths, M. N. Davies and D. Chappell, 'Online computer gaming: A comparison of adolescent and adult gamers', *Journal of adolescence*, vol. 27, no. 1, pp. 87–96, 2004.

[118] S. Huh and D. Williams, 'Dude looks like a lady: Gender swapping in an online game', in *Online worlds: Convergence of the real and the virtual*, Springer, 2010, pp. 161–174.

[119] GameSpot, *Why do we change gender? character creation psychology! (part.2) - reality check*, 2014. [Online]. Available: https://www.youtube.com/watch?v=G5s2V-K1vwE.

[120] J.-K. Lou, K. Park, M. Cha, J. Park, C.-L. Lei and K.-T. Chen, 'Gender swapping and user behaviors in online social games', in *Proceedings of the 22nd international conference on World Wide Web*, ACM, 2013, pp. 827–836.

[121] E. MacCallum-Stewart, 'Real boys carry girly epics: Normalising gender bending in online games', *Eludamos. Journal for Computer Game Culture*, vol. 2, no. 1, pp. 27–40, 2008.

[122] Noctua, *The psychology behind character creation – part 2*, 2015. [Online]. Available: https://gamersdecrypted.com/the-psychology-behind-character-creation-part-2/.

[123] N. E. Seymour, A. G. Gallagher, S. A. Roman, M. K. O'brien, V. K. Bansal, D. K. Andersen and R. M. Satava, 'Virtual reality training improves operating room performance: Results of a randomized, double-blinded study', *Annals of surgery*, vol. 236, no. 4, p. 458, 2002.

[124] A. Rizzo, T. D. Parsons, B. Lange, P. Kenny, J. G. Buckwalter, B. Rothbaum, J. Difede, J. Frazier, B. Newman, J. Williams *et al.*, 'Virtual reality goes to war: A brief review of the future of military behavioral healthcare', *Journal of clinical psychology in medical settings*, vol. 18, no. 2, pp. 176–187, 2011.

[125] G. M. Reger, K. M. Holloway, C. Candy, B. O. Rothbaum, J. Difede, A. A. Rizzo and G. A. Gahm, 'Effectiveness of virtual reality exposure therapy for active duty soldiers in a military mental health clinic', *Journal of traumatic stress*, vol. 24, no. 1, pp. 93–96, 2011.

[126] D. A. Bowman and R. P. McMahan, 'Virtual reality: How much immersion is enough?', *Computer*, vol. 40, no. 7, 2007.

[127] P. Brey, 'The ethics of representation and action in virtual reality', *Ethics and Information technology*, vol. 1, no. 1, pp. 5–14, 1999.

[128] C. D. Navarrete, M. M. McDonald, M. L. Mott and B. Asher, 'Virtual morality: Emotion and action in a simulated three-dimensional "trolley problem".', *Emotion*, vol. 12, no. 2, p. 364, 2012.

[129] I. Patil, C. Cogoni, N. Zangrando, L. Chittaro and G. Silani, 'Affective basis of judgment-behavior discrepancy in virtual experiences of moral dilemmas', *Social neuroscience*, vol. 9, no. 1, pp. 94–107, 2014.

[130] X. Pan and M. Slater, 'Confronting a moral dilemma in virtual reality: A pilot study', in *Proceedings of the 25th BCS Conference on Human-Computer Interaction*, British Computer Society, 2011, pp. 46–51.

[131] A. Skulmowski, A. Bunge, K. Kaspar and G. Pipa, 'Forced-choice decision-making in modified trolley dilemma situations: A virtual reality and eye tracking study', *Frontiers in behavioral neuroscience*, vol. 8, p. 426, 2014.

[132] R. J. Sullivan, 'The kantian critique of aristotle's moral philosophy: An appraisal', *The Review of Metaphysics*, vol. 28, no. 1, pp. 24–53, 1974, ISSN: 00346632. [Online]. Available: http://www.jstor.org/stable/20126582.

[133] I. E. Aron, 'Moral philosophy and moral education: A critique of kohlberg's theory', *The School Review*, vol. 85, no. 2, pp. 197–217, 1977. DOI: 10.1086/443328. eprint: https://doi.org/10.1086/443328. [Online]. Available: https://doi.org/10.1086/443328.

[134] A. SEN, 'Equality of what?', 1979.
[135] J. M. Doris, 'Persons, situations, and virtue ethics', *Nous*, vol. 32, no. 4, pp. 504–530, 1998.
[136] G. Harman, 'Moral philosophy meets social psychology: Virtue ethics and the fundamental attribution error', in *Proceedings of the Aristotelian society*, JSTOR, 1999, pp. 315–331.
[137] E. Slingerland, 'The situationist critique and early confucian virtue ethics', *Ethics*, vol. 121, no. 2, pp. 390–419, 2011.
[138] M. Merritt, 'Virtue ethics and situationist personality psychology', *Ethical theory and moral practice*, vol. 3, no. 4, pp. 365–383, 2000.
[139] L. Son, *3 famous moral dilemmas that will really make you think*, 2014. [Online]. Available: https://thoughtcatalog.com/lenna-son/2014/06/3-famous-moral-dilemmas-that-will-really-make-you-think/.
[140] K. Ross, *Some moral dilemmas*, 2017. [Online]. Available: http://www.friesian.com/valley/dilemmas.htm.
[141] YourDictionary, *Ethical dilemma examples*, 2018. [Online]. Available: http://examples.yourdictionary.com/ethical-dilemma-examples.html.
[142] E. Stevens, *5 video games that pose (and reward) awful moral choices*, 2016. [Online]. Available: http://www.cracked.com/article_23942_5-awful-behaviors-video-games-reward-you-for.html.
[143] J. Robbins, *18 super messed up decisions video games have forced you to make*, 2018. [Online]. Available: https://www.ranker.com/list/moral-dilemmas-in-video-games/jason-robbins.
[144] D. Floyd, *Video games and moral choices*, [online], 2010. [Online]. Available: https://www.youtube.com/watch?v=6_KU3lUx3u0.
[145] E. Inc., *Vecteezy*, 2018. [Online]. Available: https://www.vecteezy.com/.
[146] MoralFoundations.org, *Moral foundations questionnaire*, [online], 2013. [Online]. Available: http://www.moralfoundations.org/questionnaires.
[147] G. Campos, *Professors simulate life-and-death moral dilemmas with vr*, 2018. [Online]. Available: https://www.avinteractive.com/news/virtual-augmented-mixed/philosophers-produce-vr-simulations-moral-dilemmas-23-02-2018/.
[148] K. B. Francis, C. Howard, I. S. Howard, M. Gummerum, G. Ganis, G. Anderson and S. Terbeck, 'Virtual morality: Transitioning from moral judgment to moral action?', *PLoS One*, vol. 11, no. 10, e0164374, 2016.
[149] EYEmaginary, *Car ai tutorial # 1 (unity 5) - make the path*, 2016. [Online]. Available: https://www.youtube.com/watch?v=o1XOUkYUDZU.
[150] ——, *Car ai tutorial # 4 (unity 5) - moving the car*, 2017. [Online]. Available: https://www.youtube.com/watch?v=oMkq1ntLZPc.
[151] I. E. of Philosophy, *Care ethics*, 1995. [Online]. Available: https://www.iep.utm.edu/care-eth/#H2.

Appendix A

Example dilemmas used in web survey

Figure A.1: Abandon dilemma.

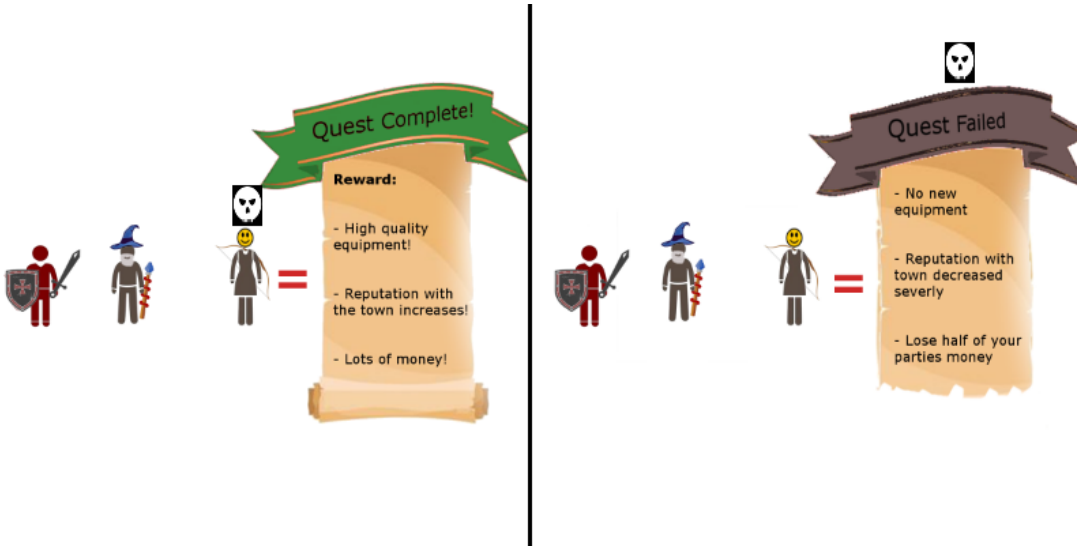


Figure A.2: Baby dilemma.

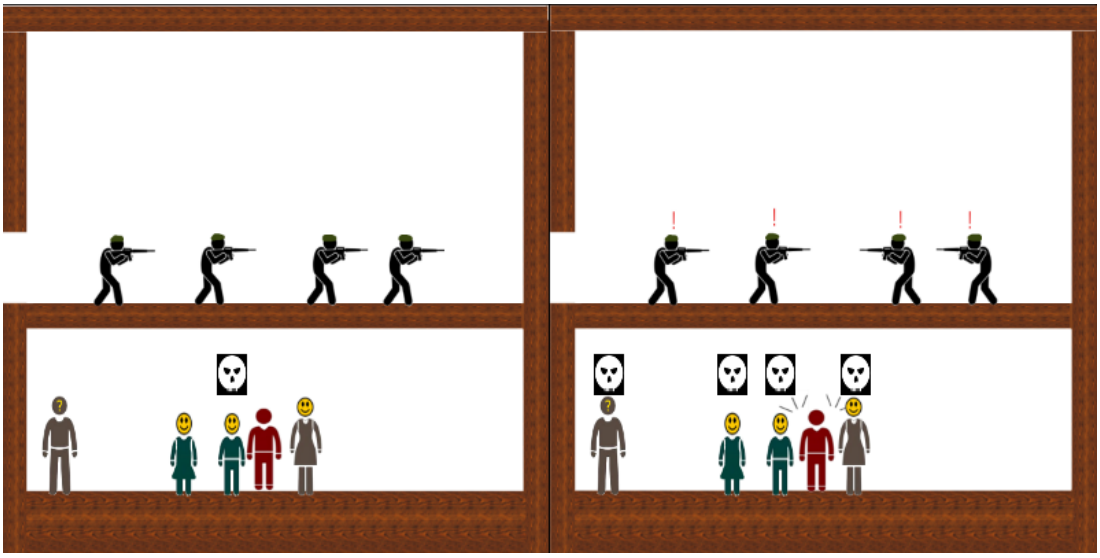


Figure A.3: Civilian dilemma.

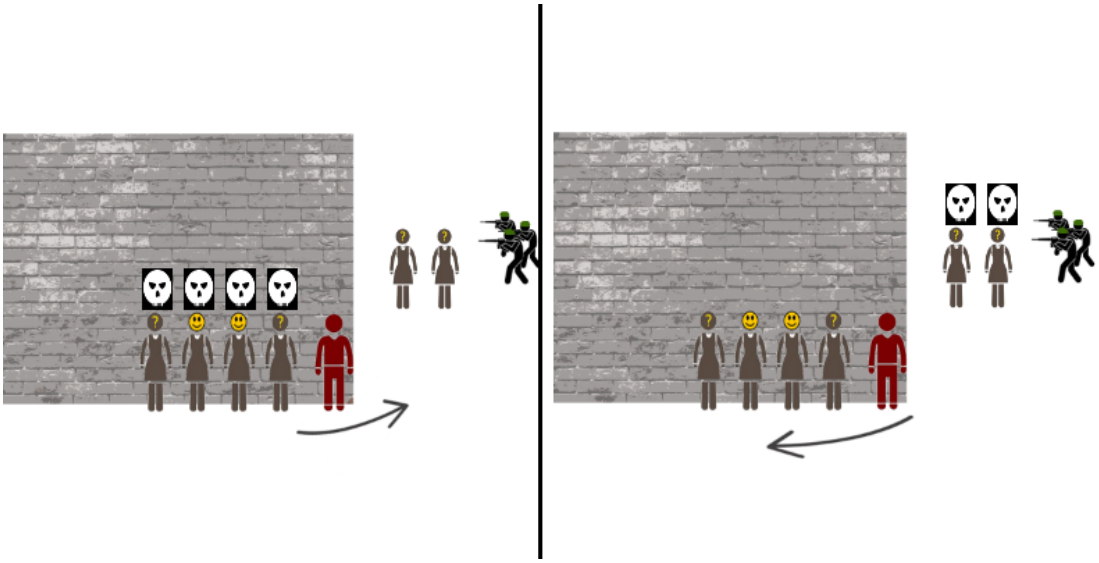


Figure A.4: Fat Man dilemma.

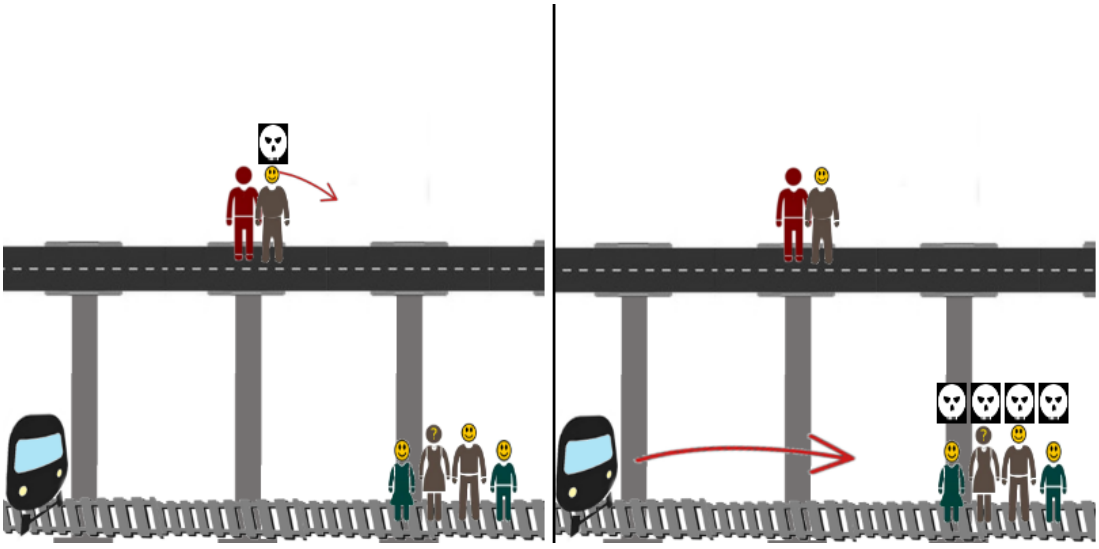


Figure A.5: Gate dilemma.

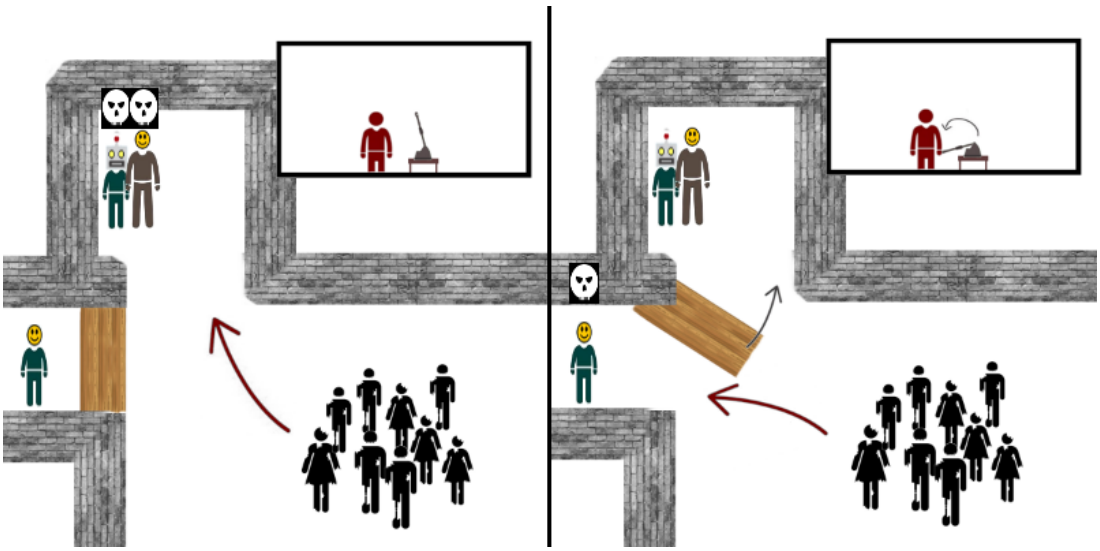


Figure A.6: Horde dilemma.

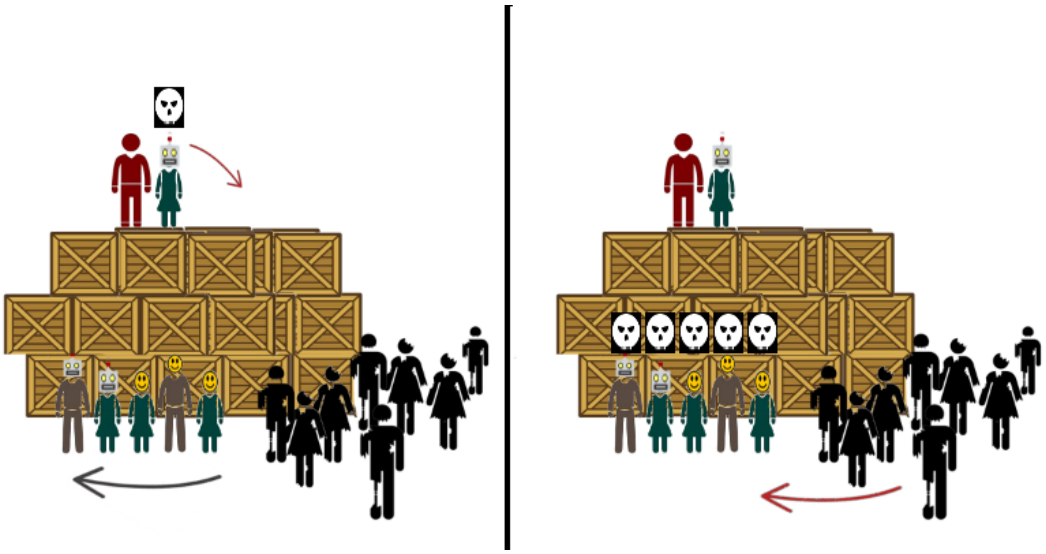


Figure A.7: Lifeboat dilemma.

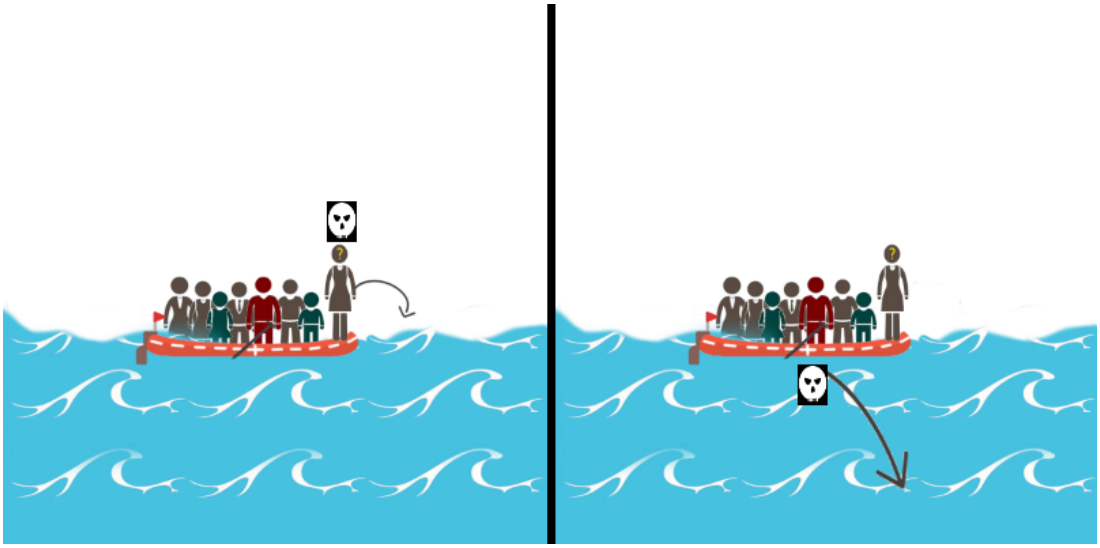


Figure A.8: Squad Split dilemma.

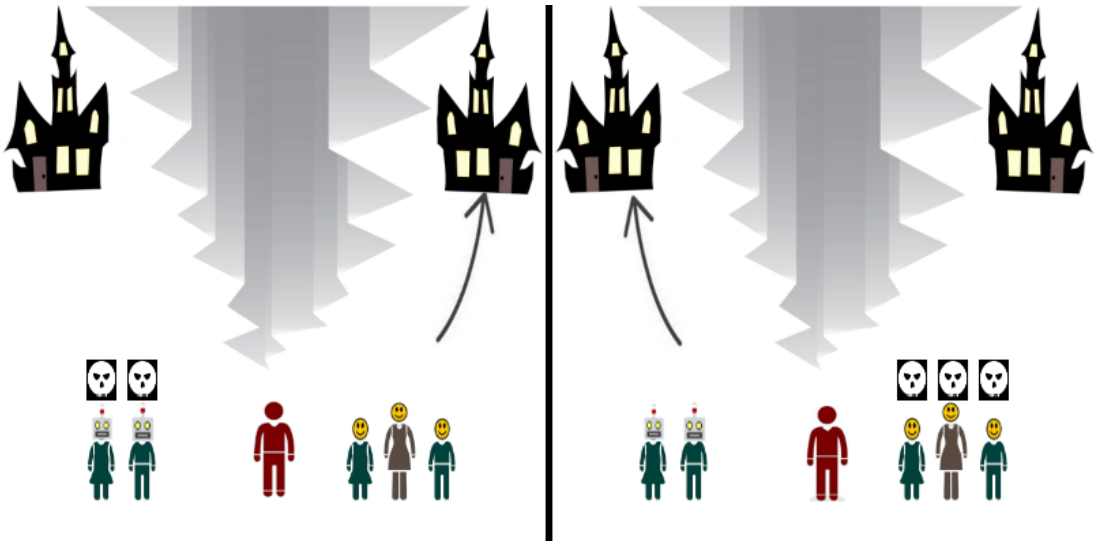


Figure A.9: Trolley dilemma.

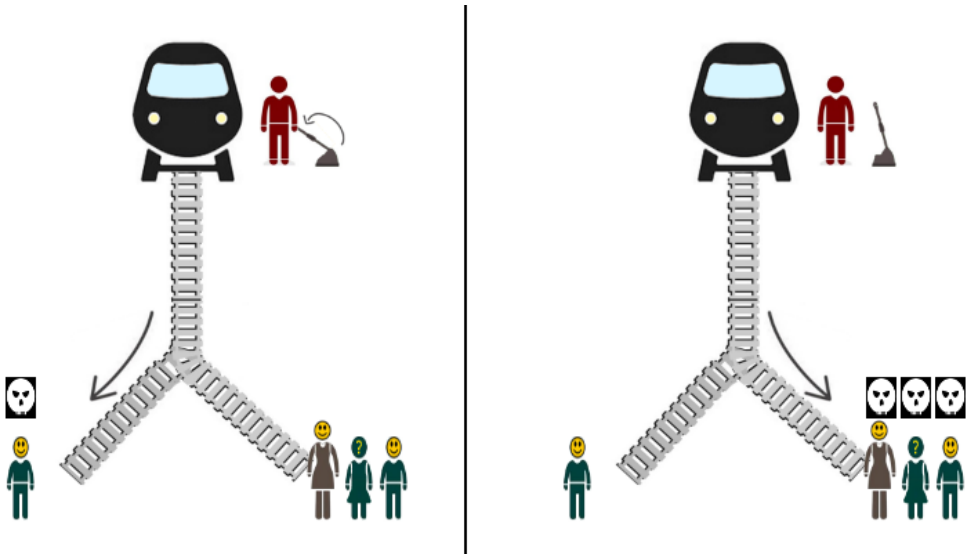
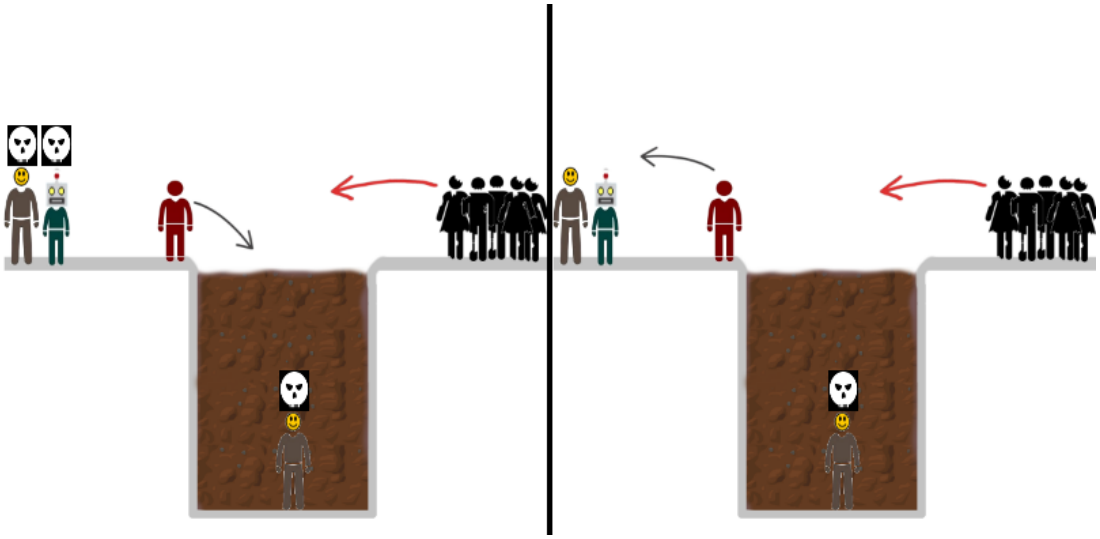


Figure A.10: Zombie dilemma.



Appendix B

Characters used in virtual reality dilemmas

Figure B.1: Female characters.

Figure B.2: Male characters.

Figure B.3: Non-human characters.

Appendix C

Study materials

PARTICIPANT INFORMATION SHEET

Participant Gender: **Participant Age:**

Title of Project: Ethical Behaviour and Moral Decision Making within Virtual Worlds

Researcher: Tom Smith

Supervisor: Dr Chris Headleand

Project Description: This research is investigating moral behaviour that players exhibit in virtual worlds such as video games and virtual reality. The area of research that this study focuses on is decisions made in moral dilemmas when presented in virtual reality, and whether ones' personal moral frameworks for making these decisions is reflected in the virtual world, or whether they display any new or different methods when making these decisions.

What will happen: The study is split into several stages, firstly you will answer a Moral Competence Test and a Moral Foundations Questionnaire to gather an understanding of your moral judgement processes. Secondly, you will be using the Oculus Rift and Touch controllers and the researcher will explain what the simulation consists of and will guide you through this section of the study, the scenarios will be explained, and practice exercises are provided in the simulation to acquaint you with the controls. Finally, after completing the Oculus Rift section you will be given the Moral Competence Test again to complete.

Possible Risks: The virtual environment is safe to use as you only need to reach and either grab or push objects. The only possible risk is hitting the edges of the test area; however, the researcher will warn you if you start to move towards the boundaries.

Time Commitment: The study will typically take between 15 – 30 minutes to complete.

Participant's Rights: (i) You may withdraw from this research study at any time without explanation; (ii) You have the right to omit or refuse to answer or respond to any question asked of you; (iii) Providing they don't interfere with the study's outcome, you have the right to have any questions answered; (iv) You may refuse to be recorded.

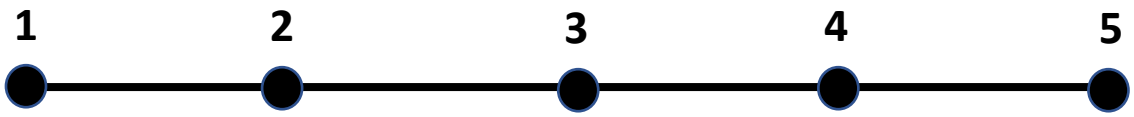
Confidentiality/Anonymity: All data collected from this study will be anonymised, and there will be no way to link it to any personal information to which you can be identified (e.g. your name, email address, etc.). All recordings will be transcribed then immediately deleted, the transcriptions will be stored under your participant number along with your questionnaire responses. After the study is completed, your anonymised data may be made available to other researchers via accessible data repositories and possibly used for publications.

Further Information: If you have any further questions after reading this information sheet, please ask the researcher before the study begins.

Study 2 - Medical Screening Form

We operate this study according to the University of Lincoln School of Computer Science Health and Safety Guidelines for Virtual Reality (VR) equipment. However, before you take part, it is important to determine whether you have any conditions which might impair your ability to use the VR equipment safely or otherwise pose harm to your person.

Firstly, please rate your prior experience using VR equipment:



(No prior experience in using VR)

(Very experienced in using VR)

Please circle either 'yes' of 'no' to answer the following questions. If you need any help of wish to ask for further clarification, please ask:

Do you suffer from Epilepsy, or a similar condition which may be triggered by flashing lights of visual stimulus?	**YES/NO**
Do you suffer from any significant uncorrected problems with your vision, such as tunnel vision? (this excludes the requirement for glasses or contact lenses).	**YES/NO**
Are you pregnant?	**YES/NO**
Do you suffer from any conditions (e.g. related to mobility) which could cause you to be unduly injured by bumping into objects, or people, of by falling to the floor?	**YES/NO**
Do you suffer from Claustrophobia?	**YES/NO**
Do you suffer from any other condition which you think might affect your ability to use the VR?	**YES/NO**

Please do ask if you would like to discuss anything relating to these questions.

INFORMED CONSENT FORM

Title of Project: Ethical Behaviour and Moral Decision Making within Virtual Worlds

Researcher: Tom Smith

Supervisor: Dr Chris Headleand

1. I confirm that I have read and understood the Participant Information sheet provided for the above study. I have the opportunity to consider the information, ask questions and have had them answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. ☐

3. Should I wish to withdraw I understand how I can action this. ☐

4. I agree to take part in the above study. ☐

Participant's Name

Participant's Signature

Researcher's Signature

Date

Moral Foundations Questionnaire

Part 1. When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking? Please rate each statement using this scale:

[0] = not at all relevant (This consideration has nothing to do with my judgments of right and wrong)
[1] = not very relevant
[2] = slightly relevant
[3] = somewhat relevant
[4] = very relevant
[5] = extremely relevant (This is one of the most important factors when I judge right and wrong)

_____1. Whether or not someone suffered emotionally
_____2. Whether or not some people were treated differently than others
_____3. Whether or not someone's action showed love for his or her country
_____4. Whether or not someone showed a lack of respect for authority
_____5. Whether or not someone violated standards of purity and decency
_____6. Whether or not someone was good at math
_____7. Whether or not someone cared for someone weak or vulnerable
_____8. Whether or not someone acted unfairly
_____9. Whether or not someone did something to betray his or her group
_____10. Whether or not someone conformed to the traditions of society
_____11. Whether or not someone did something disgusting
_____12. Whether or not someone was cruel
_____13. Whether or not someone was denied his or her rights
_____14. Whether or not someone showed a lack of loyalty
_____15. Whether or not an action caused chaos or disorder
_____16. Whether or not someone acted in a way that God would approve of

Part 2. Please read the following sentences and indicate your agreement or disagreement:

[0]	[1]	[2]	[3]	[4]	[5]
Strongly disagree	Moderately disagree	Slightly disagree	Slightly agree	Moderately agree	Strongly agree

_____17. Compassion for those who are suffering is the most crucial virtue.
_____18. When the government makes laws, the number one principle should be ensuring that everyone is treated fairly.
_____19. I am proud of my country's history.
_____20. Respect for authority is something all children need to learn.
_____21. People should not do things that are disgusting, even if no one is harmed.
_____22. It is better to do good than to do bad.
_____23. One of the worst things a person could do is hurt a defenseless animal.
_____24. Justice is the most important requirement for a society.
_____25. People should be loyal to their family members, even when they have done something wrong.

_____26. Men and women each have different roles to play in society.
_____27. I would call some acts wrong on the grounds that they are unnatural.
_____28. It can never be right to kill a human being.
_____29. I think it's morally wrong that rich children inherit a lot of money while poor children inherit nothing.
_____30. It is more important to be a team player than to express oneself.
_____31. If I were a soldier and disagreed with my commanding officer's orders, I would obey anyway because that is my duty.
_____32. Chastity is an important and valuable virtue.

The Moral Foundations Questionnaire (MFQ-30, July 2008) by Jesse Graham, Jonathan Haidt, and Brian Nosek.
For more information about Moral Foundations Theory, scoring this form, or interpreting your scores, see: www.MoralFoundations.org. To take this scale online and see how you compare to others, go to www.YourMorals.org